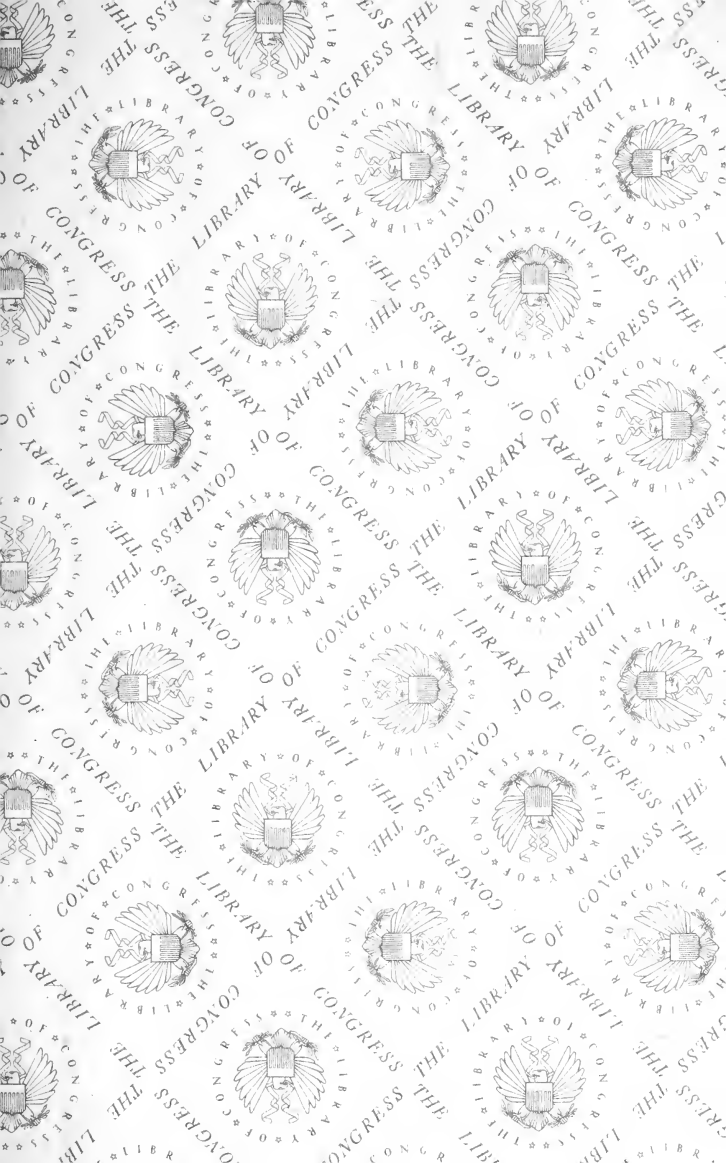
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KING COTTON;

OR,

COMMON SENSE THOUGHTS

ON THE FOLLOWING SUBJECTS, VIZ.:

COTTON vs. SILK; COTTON vs. LINEN;
PARAFFINE vs. WAX;

BEING A SERIES OF

DEMONSTRATED FACTS, SHOWING HOW TO MAKE MORE FLEXIBLE AND DURABLE SHOE BOTTOMS BY MACHINE THAN BY HAND.

ALSO,

HOW TO MAKE MORE ELASTIC AND DURABLE SEAMS IN SHOE UPPERS WITHOUT STAYS THAN HAVE FORMERLY BEEN MADE WITH THEM.

ILLUSTRATED.

BY G. W. LASCELL,
LYNN, MASS.

LYNN:
PRESS OF THOS. P. NICHOLS.
1884.

To my Valued Friend,

JOSEPH R. DIMENT, Esq.,

WHO, LOOKING STRAIGHT AT FACTS
WHICH OPPOSED HIS LIFE-LONG PREJUDICES,
AND WHO,
AS SUPERINTENDENT OF ONE OF THE
LARGEST BOOT MANUFACTURING ESTABLISHMENTS IN AMERICA,
HAD THE COURAGE OF HIS CONVICTIONS,

This volume is respectfully dedicated by the

AUTHOR.

PREFACE.

FOR the past ten years I have been intending to publish my views on the great value of cotton over silk and linen as a sewing thread. In 1877, I contributed several articles to the "*Shoe and Leather Reporter*" under the title of COTTON *vs.* SILK, and should have continued them at greater length but for my determination to publish a book on this and kindred subjects. I have made several beginnings during the past five years in the midst of the daily routine of business cares, but finding it difficult to get ten consecutive minutes in which to write, the matter was deferred until May, 1882, when I yielded to the importunities of the editor of "*The Shoe and Leather Manufacturer*," of New York, to furnish some articles for his paper. These were copied by foreign journals, notably the "*Boot and Shoe Trades Journal*," of London, which raised a formidable opposition in England resulting in a controversy from which I found it impossible to recede. This led to an increased correspondence with parties in various sections, asking for information on these matters which nothing short of a complete file of the papers in question would seem to suffice—finally all the back numbers having been exhausted I was driven to the necessity of compiling this book from my remaining file and in such haste as to render it impossible to properly revise the matter, hence I am compelled to present to the reader an incoherent mass which I had filed simply as memoranda of points to be

discussed when a more auspicious time had arrived. I have this consolation however, that time and events have proven my premises correct; that what my critics deemed extreme fallacies, have become demonstrated facts, and however incoherently the subjects may be presented, the reader may gather from this book a fund of information which it will be very imprudent to ignore.

Since I began the agitation of this question (in 1875), over four hundred shoe manufacturers have adopted the system of seaming shoe uppers, set forth in the following pages, and the glove manufacturers of this country may be surprised to learn that the French are now supplying this market with gloves the seams of which are too elastic to be broken, and stitched with cotton thread which has proven to be at least six times more durable than silk or linen.

The more recent agitation of the anti-wax question, and sole sewing with cotton, has awakened a wide-spread interest in the matter of making flexible shoe bottoms, since it has been demonstrated that more flexible and durable shoes can be made on the McKay machine than are usually made by hand.

And now that the full fruition of this new and important era in shoe making may be more generally and speedily realized through this feeble instrumentality is the fervent desire of the

AUTHOR.

CHAPTER I.

COTTON THREAD BETTER THAN SILK OR LINEN FOR STITCHING LEATHER.

THERE is nothing of more importance in the make up of a shoe than the thread by which the parts are united, for if the seams give out, the shoes are worthless. It becomes necessary, then, to inquire which of the various kinds of thread in use will give the best results, and secondly, how to get it into the shoe with the least possible injury. If any shoe manufacturer supposes that the thread enters the shoe at its pulling strength on the spool, the sooner that he is aroused from such a delusion the better it will be for the credit of his goods.

HOW THREAD IS WORN.

By exact measurement, it is found that the hook of the Wheeler & Wilson machine pulls down 4½ inches of thread, and any stitcher will bear me out in the assertion that ⅛ of an inch is a large average allowance of thread for a single stitch to take up. Now as there are 36 eighths in 4½ inches, it necessarily follows that the 4½ inches of thread passes downward 36 times, and the "take-up" jerks it upward 36 times, which altogether makes exactly 72 times that the thread passes through the needle before the stitch is planted in the leather. This being true, is it any wonder that seams fail? But we hear the objector say:

"That can't be true, for the needle goes down but once to form a stitch and the 'take up' pulls the thread up, which makes it pass through the needle only twice to complete a stitch."

We grant all that as being true *as to the first stitch*, but the second stitch has taken the thread through four times, and the third stitch six times, and the fourth stitch eight times, and the fifth stitch ten times, and so on to the end of the original 4½ inches pulled down to form the first stitch, when the last eighth shall have passed through the needle just 72 times, and from that on to the end of the spool, every identical eighth inch of thread must pass not only through the needle but through the tension and the various thread guides leading to the needle, and last but not least through the leather also; and the wonder is that there is any strength to the thread left. Hence it is that the smoothest and best made needle is by far the cheapest, and the time is probably not far distant when the inquiry, "Who makes the best needle?" will become general, and the hazardous policy abandoned of adopting the needle that can be had for the least money.

Having submitted these matters to Mr. James E. A. Gibbs, of the Willcox & Gibbs Sewing Machine Company, the oldest sewing machine inventor now living, he replied as follows:

"You are quite right in these matters. The fact is, the needle does all the sewing, anyway; give me a good needle and I will do good sewing, with almost any sewing machine."

Every stitcher will notice that when commencing a seam the stitch looks smooth and satisfactory, but after progressing an inch or two the stitch presents quite a different appearance. This is because the thread is but little worn at the start, as above stated, and were it not for bad places made by stopping and starting in again, it would be much *better for the shoe* to break the thread and start anew at the end of every inch and a half of seam. Now, as the wearing of the thread in sewing (as well as in the finished seam) is so great, it is of vital importance to know *what kind of thread* is the most durable; in other words, which of all the fibrous substances of which threads are made, will stand the greatest amount of friction. I stated five years ago (only to be laughed at) that this fibre was COTTON. I well knew the

effect likely to be produced by such radical ideas, and did not venture to announce them without having fully tested the truth of the statements made. My investigations at that time had extended over a period of two years or more, and several pairs of shoes had been made and worn out, one of each pair being seamed on a Howe machine with silk (upper and under threads) and the other on a Willcox & Gibbs Automatic Tension machine with a single cotton thread. In each case the shoes stitched with cotton stood the test of wearing out both sole and upper, while those closed with silk failed in from five to ten weeks. The exhibition of these test shoes accompanied by their history as to day and date, etc., led one after another to investigate and make similar tests, until now in this year, 1882, there is scarcely to be found a shoe manufacturer in Essex County, Mass., who would dare risk the old method as against what has proven to be the only true and safe one, viz.: seaming with cotton thread. The use of cotton thread is by no means confined to Essex County, but has spread throughout the State of Massachusetts, and extended to Maine, New Hampshire, New York, Ohio and Minnesota, and the shoe manufacturers who have adopted the views set forth above are now numbered by hundreds, as ere long they must be by thousands.

One reason of the greater durability of seams made with cotton, lies in the fact that the thread is planted in the shoe comparatively uninjured. The second reason is that the twisted loop-stitch is so elastic that no elasticity of thread is required, although there is more elasticity in cotton than in linen, but not so much as in silk. Of course, these radical ideas did not take root everywhere at once, many being too timid to abandon the old method for the new, but gradually they were compelled to acknowledge that "Cotton was King," and thus it has been that what at first was considered absolutely foolish by many, has been generally — indeed, almost universally — accepted in this section of country; and it is a remarkable fact that not a single manufacturer can be

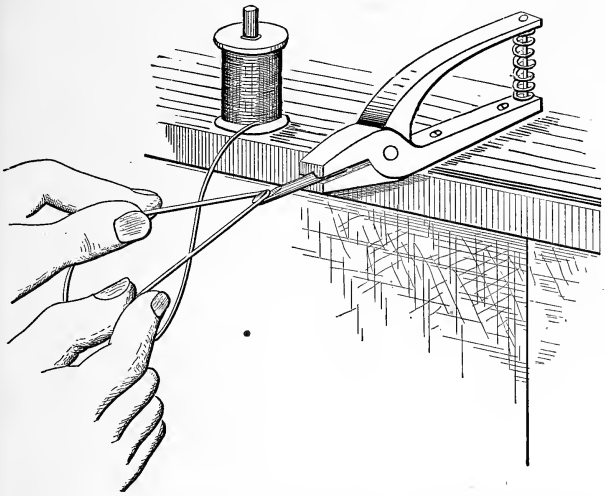
found who, having adopted the new method, has abandoned it for the old or any other way of making durable seams. A stronger confirmation than this, of the truth of these statements concerning the superiority of cotton in seaming, could not well be produced.

The above is but a mere outline or summary of facts which have been developed during the past five or six years. Previous to that time, very little attention was paid to the manufacture of cotton threads for shoe work. About the only cotton then known to the trade was a cheap grade, used and sold as "bobbin cotton," which was also used in making shoe linings. The agitation of this question, however, has been the means of bringing out an article of cotton which is but little (and some makes of thread are not at all) inferior in finish and tensile strength to silk.

Shoe manufacturers will invariably judge of the durability of thread by the number of pounds strain it will bear, and hence they jump at the erroneous conclusion that silk or linen is superior to cotton, while the fact remains that the number of pounds a thread will pull has no more to do with the durability of a seam stitched with it than mathematics has to to do with the growth of a plant. The test of thread in a shoe is the amount of *friction* it will endure by the constant bending of the seam, as at the ball of the foot in a congress boot, or at the top of the stiffening at the heel and in the crimp in front. It is found that at these points the stitches break; or in other words, they wear in two by the constant rubbing or friction at every step. This constant *bending* often causes the *leather* to break in the wrinkle formed at the ball of the foot on the outside, and it is hardly to be wondered at that the thread will wear in two in less time, although in one of the tests first above mentioned, the break of the leather and one stitch in the wrinkle at the ball was simultaneous.

As to the durability of cotton in comparison with linen, we speak from daily use of the latter in grinding the hooks of

our McKay and wax thread machine needles. These hooks are cut before the needles are tempered, and after tempering comes the smoothing process, or the grinding off of the sharp corners of the tempered steel. To accomplish this, the needle is held in a clamp, as shown in the accompanying sketch,



SHOWING ONE METHOD OF TESTING COTTON AND LINEN THREAD.

and a thread (the size of the one the needle is intended to carry) is saturated with oil and emery, and drawn rapidly back and forth through the hook until the sharp corners are worn off smooth. By the process described, the thread is worn in two very soon, when more is drawn from the spool and again and again it is worn out, and on an average three or four threads are worn out in finishing one needle. We had a cotton thread made of the same size to do this work,

preparing it in the same way, and found that we could finish a needle completely with *one* thread, and yet the thread remain whole, though reduced in size by wear. This reduction in the size of the thread tended to make the hook narrow and V-shaped in the bottom, whereas it should be the reverse. We were forced, in consequence, to abandon the cotton and go back to the linen, because of its brashy nature, which caused it to broom up in wearing and enlarge to three times its original size. This made the linen more valuable for this purpose, although not as durable by at least two-thirds. As an illustration of the superior wearing qualities of cotton over linen, it is hard to conceive of a better test than the above, while at the same time it tends to establish the fact previously stated, that the number of pounds a thread will pull has nothing whatever to do in determining the comparative durability of a seam closed with it.

If I were offered several brands of linen, I should say that the strongest was the best, and of one cotton thread as compared with another, should conclude that the strongest contained the best quality of cotton and the longest fibre, and should say the same as to silk; but because a silk or linen will pull more pounds than a cotton thread, to conclude that it is therefore as much more durable as it is stronger, is extremely fallacious, as any one can easily demonstrate by experiments.

THE PULLING TEST.

Apropos to the foregoing, it may not come amiss to ask and answer a few pertinent inquiries. First, then, what is the use of the pulling test, except to ascertain which of any two or more brands of any one kind of thread—viz.: cotton, silk or linen—is superior?

We answer, none whatever, since in either kind you have more actual pulling strength than can by any possibility be appropriated by the wearer of the shoe, as a few figures will demonstrate.

Suppose your silk pulls 10 pounds, and you put 20 stitches to the inch of your seam. That would give on a congress boot (say 10 inches length of seam) just 2,000 pounds' strength of thread to hold one side of the boot to the other, because you have 10 pounds' pulling strength to each and every stitch. Now, we have before stated that the best cotton thread of to-day will pull very nearly as much as silk. But we will suppose it to be only half as strong; that would give 1,000 pounds to hold one half the upper to the other, which is at the least *six times* the strength required. A woman that weighs 175 pounds, bearing her whole weight on one foot, does not produce 175 pounds lateral strain on the upper, nor any considerable portion of it, for the reason that the main pressure comes directly on the *sole*, which is being pressed hard to the ground, and there is the lateral strain on the sole also. Now, when this downward pressure on the bottom and the lateral strain on the sole is deducted (if the truth of the matter could be accurately figured out), it would be found that but a small residue remains to apply to the *upper*, and that would always be within the limit of endurance of the wearer, as a large majority of people have tender feet, while the soundest feet could not stand two-sixths of the pressure the poorest cotton would give.

When an iron stretcher is put into a shoe to enlarge it by stretching it across the ball, the superficial observer could hardly fail of noticing the immense pressure that is produced by the leverage of the screw thus applied. It has often been a matter of surprise that the seam or even the leather could withstand it, though unlike the foot, the stretcher puts at least two-thirds of the strain directly on the upper, as the leather impinges tightly upon the iron, both on the sides and top, the bottom only taking its share of the lateral strain minus any downward pressure as given by the wearer of the shoe. This simple matter proves our assertion that the strength of thread in a seam is the number of pounds the thread will pull multiplied by the number of stitches to the

inch, and this should also show the folly of paying the cost of a ten-pound silk (since but so small a fraction of its strength can ever be appropriated), as against the much better as well as cheaper cotton thread, the pulling strength of which is so many times greater than there is any need of.

When manufacturers learn that the most durable thread for either shoes, gloves or clothing is that which will *endure the most friction*, regardless of its comparative tensile strength, they will have taken a very important step in a pecuniary point of view, and one they will have frequent occasion to regret not having taken much earlier.

CHAPTER II.

HOW TO MAKE A "McKAY SEWED BOTTOM" MORE DURABLE AND FLEXIBLE THAN HAND-MADE.

COTTON THREAD VS. LINEN—WAX USELESS.

In the elucidation of this subject, it becomes necessary, in the first place, to establish the superiority of cotton thread for this purpose, and secondly to show up the uses and abuses of wax, as well as to give good and valid reasons for abandoning it entirely and substituting a much better material; and further, to consider matters incidental to all that goes to make a more flexible and durable shoe bottom. It is a notorious fact that when a shoe is taken from the horn of a McKay machine, it is stiffer than a pegged bottom containing the same number of pegs, as the shoe has stitches, (say three or four to the inch), and it is proposed, further along, to give the reasons why this is so.

First, then, as to cotton thread for shoe bottoms. In the preceding chapter it was shown that a cotton thread would stand three or four times as much chafing in grinding needles as a linen thread of the same size, and it is reasonable to conclude that the same would be true as to the chafing of a stitch in a shoe sole, for this is what wears the thread in two and separates the sole from the upper, and in many cases, before the shoe is half worn out.

THE GOODYEAR TEST.

Some two years ago we furnished Mr. Goodyear (the inventor of the Goodyear welt and turn shoe machines) with some cotton thread with which to make the writer a pair of

test shoes, according to certain specific directions—the explanation of which seemed to interest Mr. Goodyear, who ordered test shoes, made in like manner, for himself and sons. Becoming restive, however, and impatient for results, Mr. Goodyear concluded to try an experiment. The cotton we furnished was quite too small for shoe bottoms, but as it was the largest we had, and the same size as Barbour's four-cord linen thread, Mr. Goodyear procured some of the latter; and, holding a piece between the thumb and finger nails of each hand, as shown by the accompanying sketch, commenc-

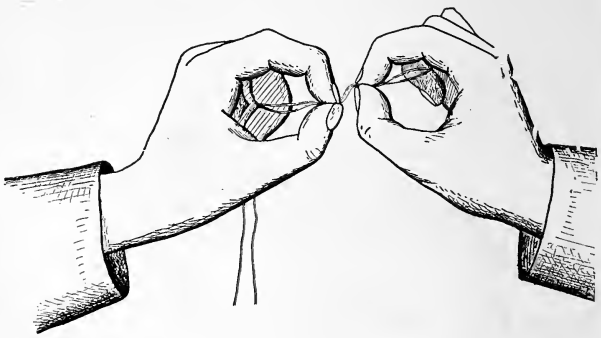


FIG. 2.

ed to chafe the thread in two by moving his hand rapidly to and fro, and succeeded in parting the last strand at the expiration of fifteen minutes. He then took the cotton thread of the same size, and holding it in the same manner, commenced his labors again. He worked at it until (as he said) his arms ached up to his shoulders, and, finding that he had worked ONE HOUR AND A HALF *without breaking a single strand*, ceased any further effort in that direction, as the test was not only conclusive, but more than made good every statement I had made relative to the superiority of cotton.

Thinking, however, that perhaps the experiment which has just been described was not exactly equivalent to the conditions and action of the *soles of a shoe* upon the thread, he devised a test which, in effect, would be nearly, if not quite, identical with the wear of thread in a shoe in active service. He prepared two blocks of hard wood with planed surfaces and of equal dimensions, and bored a series of holes in parallel rows transversely through both, and then sewed linen thread through both from the end to the centre of the block, and cotton thread of same size from the centre to the opposite end. He then secured one block in a vise, as shown by the accompanying sketch, and grasping the other

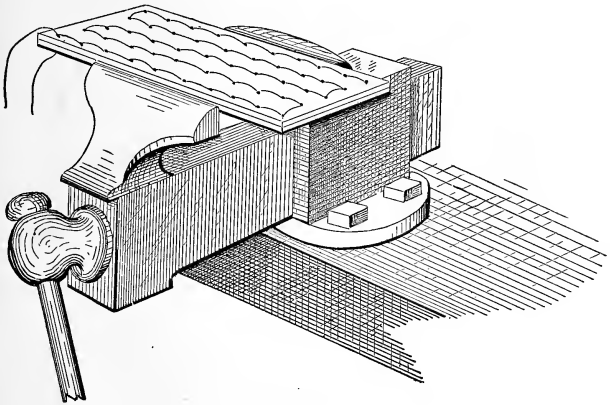


FIG. 3.

with his hand, pushed it back and forth as far as the stitches would allow. The time was not taken in this experiment, as both threads were being acted upon simultaneously and under precisely the same conditions, although, according to his judgment, he had worked about half an hour, when every

linen thread stitch had worn in two and every cotton thread stitch remained whole. These tests quieted Mr. Goodyear's anxiety as to the results to be obtained from the test shoes then being made. The shoe tests were unequal however, in this, that the linen thread used was Finlayson's best eight-cord, while the cotton thread was only the size of Barbour's four-cord McKay thread, and the same needle was used in sewing the small cotton as the large linen thread. The sewing never gave out in either, the shoes both lasting exceedingly well, wearing out the soles and a pair of taps.

Having now furnished the key by which any one interested in the subject can demonstrate the truth of the foregoing statements for himself, relative to the superiority of cotton as compared with linen thread for shoe bottoms, or, in fact, for anything in the way of seaming, we will pass on to consider the

USE OF WAX.

In this, as in very many things, too much is taken for granted, and the subject is allowed to pass unchallenged.

The habit of wrong thinking upon any given topic (or of no thinking) tends to close all avenues of thought in the direction of improvement, and as a result business is done at such a loss that if the same percentage was imposed in the form of a tax by the government it would be deemed an insupportable burden which would soon terminate in armed rebellion.

It is altogether probable that no shoe manufacturer ever stopped to consider whether wax was of any real use or not, as it is universally conceded to be indispensable and has been so considered for centuries past. We undertake to say, however, that wax, as used in sole sewing with the McKay machine (for it is that specialty that we are now dealing with), is not only useless, but *absolutely detrimental to the shoe.* It is that which makes the bottom so stiff and inflexible, and that very stiffness leads the stitcher to pride himself

on the *solidity* (?) of his work. He takes the shoe from the horn, bends it; it feels solid (stiff), and he says "that's business," and we say yes, *bad business.*

If we ask him why he uses wax, he says "to make the thread *hold*, of course."

Now we say that you may pick up an old shoe sewed on the McKay machine, one that has been worn down to the bottom of the channel, to the extent of wearing off the tops of the stitches, and you will find the thread as dry and *destitute of wax* as it was when it left the thread mill. It is but recently that a merchant came to Lynn to see one of our best shoe manufacturers in order to give him a lecture, he having discovered the secret of the ripping of their shoes, as he supposed. He brought *substantial proof* of his theory in his pocket, which he pulled out and said:

"Now, Mr. B., I came to complain of your shoes ripping and to tell you the reason of it. *You sew your shoes without any wax.* Here is one of them and you can see for yourself there was never any wax on that thread."

Mr. B. was not a little amused, and he soon satisfied his customer that their goods were not only sewed with as much wax as the thread would carry, but that there was much to be learned yet, not dreamed of in his philosophy.

Now, if wax is of any use in a McKay sewed shoe bottom it is "to hold the thread" from slipping out *after the loops are worn off;* before that there is certainly no need of any, and if after the stitches are worn off there is no wax left on the thread, then we would like to have some one inform us why its use is continued.

It is not until a shoe has been worn some weeks and the dry and thirsty sole leather (if we may be allowed the expression) has absorbed all the oil from the wax, leaving the resin to crumble to atoms, that a bottom becomes easy to any considerable degree, and just in proportion as the wax becomes disintegrated, does the bottom become flexible. So

long, however, as the wax remains *wax*, you have a more rigid bottom than if pegged or nailed. The reason for this is that the wax sticks the two arms of the loops to each other, and, if they would yield up their elasticity, the thread must move in opposite directions; it also sticks the loops to the channel, to the leather in the needle hole, and on the surface of the inner sole; in fact, all around, the thread is fixed immovable by the wax, and thus the stitches become more rigid than so many rivets, because a rivet would stand by itself independently, while the stitches are like so many rivets *tied to each other at both ends* as by a strap of metal connecting them. Hence, the rigidity of the McKay sewed bottom, all of which can much better be avoided than continued, as will be shown further on.

We state, without fear of successful contradiction, that wax is an intolerable nuisance besides being devoid of a single redeeming quality, so far as its use in sole sewing is concerned, and the reasons are, first, that it so clogs the thread as to render it impossible (even with all the tension the thread will endure) to draw in the stitches so as to get the soles together with sufficient firmness to prevent them from working and cutting off the stitches directly between them. One reason why this cannot be done is owing to the peculiar formation of the loop-stitch. The stitch being taken, tightening up the stitch next preceding, and the thread having been drawn up and held *above the shoe*, and at the time completely cut off from the heat in the horn, the wax becomes more or less chilled, and when the hook descends and takes up another loop, all this two or more inches of *chilled* thread is carried down and completely around the leather between the needle holes by the stitch next in process of formation. This back-handed manner of forming the stitch, or rather, of drawing it in, requires the entire pulling strength of the thread, be it seventy, eighty, or even a hundred pounds, according to the thickness of the soles; and even then, notwithstanding the sewing feels stiff and solid, the fact

remains that the stitches are *not* drawn in sufficiently tight to bring the soles as snug together as necessary to keep them from working and cutting off the stitches in the manner so commonly seen in McKay sewed work. When the oil of the wax becomes absorbed, and the resin has crumbled off, leaving the thread dry, you can pull the upper up from the sole and see a space that should not exist, and a slackness of thread, due to the sluggish movement of the thread in drawing in the stitches, and all on account of the wax.

The second objection to wax is that it tends to rot the thread. This fact is so common to all shoemakers who have ever worked on the seat as to hardly need argument to support it. How common it is to see nails full of "waxed ends" in a cobbler's shop, and it is as common to find the strength nearly gone from them after hanging over night. McKay operators have also noticed the rapid deterioration of the thread, especially the outer tiers on the spool, after laying from five to ten hours.

The third objection is the liability of burning the thread in passing it through the vat as well as by the blaze in the horn. Thread is passed through boiling wax, with a constant blaze under the vat, and nothing whatever to indicate the degrees of heat it is thus subjected to; and when the thread is transferred to the machine, it is subjected to another burning in the horn by a constant blaze in close proximity to it. These very probable injuries to the thread are incidental to the use of wax, it being necessary not only to keep the wax hot on the thread, but *so hot* that it will in some degree hold its heat during the time it is held above the shoe and cut off from the heat in the horn. It is impossible, however, to keep the wax hot enough.

The fourth objection is that wax besmears the shoe and the shop, as well as the reputation of the manufacturer, and supplies a wax plaster to the feet of all, indiscriminately, and in total disregard of the patient's desire or condition.

Fifth, it besmears and clogs the needle, causing it to run

hard, and this, together with the power required to haul in the waxed thread, involves fifty per cent. extra waste of needles; and when we contemplate the great inconvenience, the waste of time and gas, and the damage to manufacturers as well as to merchants and consumers, it does seem as if the powers that be had conspired to psychologize shoe manufacturers, in order to preserve the old notion that wax is an absolute necessity; and also to keep them oblivious to a thought of reform in that direction, although its use is needless and wasteful; needless, because it does not serve to hold the thread in the manner alleged. After the loops are worn off, the thread is never seen to be *pulling out.* No one ever thought of making such a complaint or suggestion any more than they would think of suggesting wax for shoe pegs for the purpose of keeping them in place. Pegs always hold well, and yet they are made of seasoned maple wood and driven dry, and worn in wet and dry weather, with the timber shrinking and swelling, and yet they stay in their places. Yet it would seem that of the two, pegs needed wax more than thread, not only because of their tendency to get loose by shrinkage, but because they are short, extending from the outside to the inside surfaces only, with no continuous doubling back and forth like a stitched thread.

Again, wax is entirely superfluous in holding a McKay stitched bottom, for the reason that the stitches wear off only in spots. It is not one time in ten thousand that a shoe sole is worn so square and level as to wear the stitches off all along the sides from shank to toe simultaneously, if, indeed, such a thing was ever known to occur. You will generally see a space of an inch at the ball outside or inside, and either side of the gap the stitches not being worn off, hold independent of wax, and at either side of the space the thread has too far to travel (in the loop stitch) to work itself out so as to enlarge the gap.

Whatever tendency you might imagine existed for so working out, you will find, nevertheless, that the stitches

stand in place like so many pegs awaiting their release by the cobbler. What folly then, to look in that direction for the difficulty, when it is always found *between the sole and the upper*, and that is where the average idiot might know that wax was useless.

Having pointed out the utter uselessness of wax in a McKay sewed shoe bottom, as well as the damage to the shoes, we now propose a *substitute;* not an untried and uncertain theory, but a *positive, effectual remedy* for the whole train of evils resulting from the use of wax. This substitute has been already tried and proven, and it solves the problem of flexibility, as well as durability, of shoe bottoms. Although it is very simple, yet in results it stands next in importance to the sole sewing machine itself. The combination is: First, Cotton thread of suitable size, with a light dressing of paraffine in which has been mixed a small percentage of beeswax. It is essential to *lubricate the thread*, and lay the fibre; and if you can lubricate and at the same time stiffen the thread so as to make it controllable in stitching, you will have accomplished your purpose, having done all that is needful to make a more durable and flexible bottom than hand made.

Right here the old habit of thought comes in and suggests that "cotton is not near as *strong* as linen," while the fact remains that there is but very little difference, but practically there might be half difference, and then your cotton possesses twenty times more strength than can by any possibility be appropriated in holding the sole on to a shoe. An atmospheric pressure equal to the strength of *one single stitch* (equally distributed over the surface) would be twice as much as would be needed to hold the sole on to a shoe. Suppose your linen thread pulls seventy-five pounds, and you have four stitches to the inch, you then have three hundred pounds to the inch, and say twelve inches around the shoe would give three thousand and six hundred pounds of strength to hold the outer sole to the inner sole!! Oh! the

poverty of the English language to adequately express the consummate folly of placing such stress upon the idea that *the tensile strength* is of any importance other than that of pulling in the stitches, and when the thread is lubricated, instead of waxed, it requires much less tension to bring the soles solidly together.

As stated at the commencement of this chapter, we have made and worn out a pair of shoes, one of which was stitched with cotton lubricated with tallow, with about twenty-five per cent. of beeswax melted in with it to stiffen the thread sufficiently to cause the loop to stand up like a waxed thread. The size of the cotton used in one shoe was that of a four-cord Barbour linen thread. The other shoe, of the same pair, was stitched with eight-cord Finlayson linen thread and waxed. Mr. Goodyear retained the shoes in his office until they were thoroughly seasoned, when he discovered something about the cotton-stitched shoe so inexplicable that he brought the pair to our office for the purpose, as he said, to get an explanation of the mystery. Said he:

"Your shoe was stitched, as you directed, with much less tension than we put upon its mate, which was stitched with waxed thread, and I discovered that with that comparatively weak tension your shoe is solid, showing no seam or crack between the welt and sole, while the other shoe does show a crack and is not as solid. I do n't understand this. Can you explain it?"

We answered that we could, and in this way. Trace the movement of the thread in the formation of the loop stitch, and you find that you pull in the stitch to a very great disadvantage (as previously stated), and owing to the thread being encumbered with wax it would not be possible with all the strain the thread or needle would stand to draw the stitch home with the force necessary to thoroughly tighten the stitch back of the one being formed; whereas in the other case, the thread being lubricated and running with such freedom, the stitches were tightened even to the third

stitch back, and this is the secret of the whole matter of solid stitching. Half the tension required for a waxed thread is all sufficient to draw the sole and welt together so firmly that there is no seam or crack visible after the sole has seasoned.

As to the test, the writer wore those shoes to tapping, and had them tapped and worn until two pairs of taps were worn out, and from the end of taps to breast of heel both shoes are sound to-day. This speaks volumes in favor of the Goodyear welt machines in contrast with the McKay, under the prevailing method of loading the thread with wax.

Previous to the test just referred to, the writer had several test pairs stitched with cotton on a McKay machine. In the first pair we soaked the thread in linseed oil (boiled), squeezing it as dry as possible before using it. In the second test pair the thread was immersed in melted tallow and squeezed dry in like manner. The soles of both wore completely out, showing no signs of ripping, and were extremely flexible and easy. The use of either oil or tallow is not practical, for the reason that when the thread is cast off the hook, the loop crinkles down, and too much care is required to make the needle strike within the loop, but the paraffine stiffens the thread about the same as wax, and stitching can be done with equal rapidity, and besides this, no heat is required in the horn, and the stitching can be done in any cold corner of the shop, or before an open window with mercury at zero, if need be, and when done the stitching is clean and white. In ordinary work we would recommend a smaller thread and needle and more stitches to the inch. The thread not larger than Barbour's five-cord linen, and the Lascell patent V-shaped large hook needle, No. 7.

One of the heaviest retail houses in Lynn, and a concern that makes its own goods (excepting pegged work and rubbers), using one McKay machine and making hand work also, has put out over two thousand pairs since last November (1881), bottomed in this manner, and the result has been

all that could be desired. Not a bottom of any description has failed in the slightest degree, and not a customer has known aught of the process, and at the same time many have spoken of the unusually easy wearing bottoms.

This concern has now fully adopted the new method, having discarded wax and heat in the horn. In all these tests they have never used anything larger, nor any other than the thread described above as having been used in the Goodyear tests. This thread is not larger than Barbour's four-cord McKay thread, and the test goods put out have comprised every variety and size of men's, women's and children's boots and shoes. On one pair of heavy calf boots made last November, there is now the third pair of taps recently put on, and from breast of heels to end of taps the original lubricated cotton sewing is as solid as when first taken from the horn. It is putting it very mild to say that this firm are extremely happy in "its find," and they will doubtless reap a good harvest ere their neighbors will have awakened to the importance of this matter, which is as certain to become universal as that shoes are to be made. "*Truth is mighty and must prevail*," and the judicious exercise of a little common sense will aid the development of the facts herein set forth, to the great benefit of all concerned.

CHAPTER III.

HOW TO STITCH A SHOE BOTTOM.

PURSUING the subject of how to make a McKay sewed bottom more durable and flexible than hand-made, it becomes necessary to notice the matter of stitching which enters largely into the account.

Some have contended (and Mr. Gordon McKay among the number, if we are correctly informed), that the best results were obtained by the use of a large needle in sole sewing, while ninety-nine out of every hundred men would say that the reverse of that should be the truth, as indeed it is. Mr. McKay was anxiously observing and solicitous about obtaining the best results as to the product of the machine *in which he held so great an interest*, and he had doubtless discovered that those who used the largest needle (in proportion to the size of thread used), had the least trouble from the ripping off of the soles. This arose, however, from the fact that the larger the hole made by the needle the less was the resistance to the thread in drawing in the stitches. Consequently, this large hole became an important factor, as the thread was always coated with black wax and needed all the room it could have, and the more the better, until you exceeded the limit of endurance of the upper and sole leather. For example, a five-cord thread following a No. 8½ needle, would pull in with so much less friction than an eight-cord, that the soles would be drawn together more firmly with the former, and as a consequence there would be less working of the soles, and the stitches would stand longer than with the eight-cord thread not so well drawn in, for it would be impossible to produce as snug a fit of the outsole to the insole

with the large as with the small thread in the same sized hole, notwithstanding the large thread would stand nearly twice the tension that the small one would do. Had it always been the fashion, however to use *liquefied* wax, Mr. McKay and others could never have made the discovery that a large needle would produce better work than a small one, as the liquid wax would have acted as a *lubricant*, and the *big* thread would have been drawn into a *small* hole, and the desired results would have been the general rule rather than the rare exception as now.

Nothing could well be more inconsistent with truth or contrary to common sense than the idea that a small thread, drawn into a large hole, would hold better than a large thread drawn into a small hole; but the solution of the wax question dissolves the paradoxical notion advanced by Mr. McKay and echoed by others; and had Mr. Blake, the inventor of the McKay machine, studied the anti-wax question in connection with his important invention, he would not have found it so necessary to make so great a virtue out of so dire a necessity as the use of wax seemed to involve.

Stitching a shoe, after it had been formed and taken from the last, necessitated the use of the loop-stitch and a *hook* for a needle. It was also supposed to be necessary to use as large or larger thread than in hand sewing, and, as a consequence, a piece of steel wire, many times larger than the thread, had to be used, in order to admit of its being cut into far enough to form a hook of sufficient size to carry the thread (see Figs. 4 and 5), and at the same time leaving sufficient strength back of the hook to withstand the strain of drawing in the stitch, as well as that of puncturing the sole, which double office the needle was required to perform. This needle made such an enormous hole, as compared with the size of the largest thread it could carry, that it became necessary to make stitches about one-third of an inch long, to prevent the leather from being entirely cut away by the needle; and it does not require any considerable stretch of

the imagination to conceive the great repugnance such a contrivance must have met at the hands of the craft, to whom the machine was first offered for sale, on account of the seeming great disparity between its work and that of hand-sewing; to wit, three stitches to the inch in place of six to

FIG. 4.

FIG. 5.

ENLARGED VIEW OF LASCELL'S PERFECTED NEEDLE IN CONTRAST WITH THE OLD STYLE ROUND BLADE.

twenty, a crow-bar of a needle in place of an awl about half as large as the thread. The writer remembers seeing Mr. Blake operating his first machine in an attic on Park Row, New York, stitching for three or four lasters, and as many finishers working on the seat. The Rebellion had broken out, creating an unusual demand for shoes, which brought the Blake machine rapidly forward, and caused its faults to be winked at for the time. The *enormous* difference between the cost of bottoming a shoe in that way as compared to any other known method, brought it rapidly into notice, and not only

commanded the attention of every shoe manufacturer of any note in the country; but it *forced* them to learn that its work was far less objectionable than they at first supposed. Now, however, after twenty odd years' vigorous use of it, I think I know what I am about to say when I add that from Mr. Blake down to the most humble consumer of shoes made on his machine, more millions of dollars have been wasted than all the royalties paid for the use of it have amounted to. If the facts now being brought out with reference to this one item of stitching can be pressed upon the attention of shoe manufacturers, they will not be slow in seeking to remedy the wasteful habits of the past twenty years, which are continued down to this present moment.

It may be asked in what does this great waste consist? We answer that first and foremost it consists in the deterioration of the shoes made, owing to the liability of the soles coming off prematurely and in many cases before the stock is half worn out, for it must be borne in mind that every grade of stock, from the highest priced to the lowest, is bottomed on the McKay machine. The average difference between the durability of McKay machine work as compared with good hand stitching would amount in and of itself to a sum bordering closely on to, if not far exceeding, all the royalties paid. It must be kept in mind also that the new process makes a more durable bottom than hand stitched (judging from the experience of the writer in wearing both as tests); and all this difference in value is borne by and distributed between the manufacturer, consumer and merchant, in the order named.

The second consideration is the damage to the upper leather by the thrust of such a monster needle with its broad hook cover A (again see Fig. 5) projecting above the barb, carrying away such a quantity of stock and causing it to protrude on the surface of the inner sole, rendering it rough and difficult to make smooth again by the most powerful of beating-out machines.

The third consideration is the extra waste of thread and consumption of needles.

The fourth is the expense of maintaining heat in the horn and extra heat in the room, in order to stitch well, besides numerous minor considerations, all of which are done away with by the new process. Now if we sum up the whole, and add the waste of time solely attributable to the use of wax, who can say with truth that these do not in the aggregate far exceed all the royalties ever paid for the use of the McKay machine, and which have amounted to many millions of dollars?

The one great drawback to the McKay machine is the necessity of using such an enormous needle as compared with the size of the biggest thread it can carry. Now a No. 8 needle is smaller than the average size used. (The size most in use is the 8½.) We here illustrate a No. 8 needle, Fig. 6,

FIG. 6

REPRESENTS AN ORDINARY MCKAY NEEDLE FULL SIZE, AND THREAD FULL SIZE USED WITH THIS NEEDLE.

full size, as well as the largest thread it will carry, viz.: six-cord, No. 16. This is also represented full size. Now the needle's full capacity is governed by the *inside measurement of the* HOOK; and on looking through the hook it will be seen that there is a vast difference between its inside area, as compared with the *outside diameter* of the blade of needle just above it. Now, although the difference is seen to be great, it will no doubt astonish every stitcher in the land to know that a round hole drilled through a block of steel that will just admit a No. 8 needle will take in twelve just such No. 16 six-corded threads!! (See Fig. 7.) The thread there-

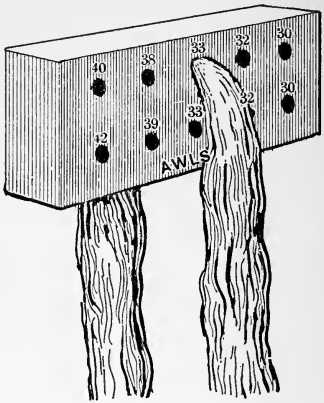


FIG. 7.

SHOWING TWELVE THREADS OF THE SIZE SHOWN IN FIG. 6, DRAWN THROUGH A HOLE IN A STEEL GAUGE OF THE EXACT SIZE OF A NO. 8 McKAY NEEDLE.

fore used in a No. 8 needle, when drawn in *double*, only fills one-sixth of the hole. The writer was not prepared for any such results as this, but was quite confident that six threads would go through our No. 33 awl gauge, which is a solid, hardened steel block, half an inch thick. We cut off six pieces of No. 16 six-cord, each a half-yard long, untwisted and separated the strands and tapered the ends, laying all of the thirty-six strands together, and twisting them lightly with the thumb and finger.

We tried the mass in the No. 8 hole, and found it did not fill it, and then put it in the No. $7\frac{1}{2}$, and finally in the No. 7, and it going in that without any difficulty we concluded that the No. 8 gauge would take *twelve* threads or seventy-two cords or strands, which we prepared as before, and notwithstanding the unyielding nature of a hole in hardened steel, and the edges of the hole being square and sharp

enough for a cutting die, we pulled in all of these seventy-two strands at once, without exerting over ten pounds strength in pulling, and without any abrasion of the thread worthy of mention. And yet it takes about sixty pounds tension to pull in one single six-cord linen thread double *when waxed*, and although the needle is six times too large for the thread, it is the smallest round-blade needle that can be used in stitching, after the manner that McKay machine stitching has ever been done.

By reference to the cut (Fig. 6) it will be seen that two-thirds of the metal forming the blade of the needle has to be cut away to form the hook; to cut away more than this would make the needle too weak to puncture the sole or to draw in the waxed thread. There is consequently a limit to the amount of thread a No. 8 or any other size will carry, and the great disparity between the size of the hole the needle makes and the size of the thread it will carry, is incidental to the invention of that peculiar method of sewing the sole on to a shoe after it had been taken from the last, rendering it necessary to stitch with a *hook*.

Now the new process which we are advocating removes all the difficulties above named, making an entire revolution in McKay stitching, and producing an entirely new class and quality of work, on that machine; work that is no less desirable in any respect than the best hand-made.

A needle hook of any given size will carry a greater bulk of cotton than linen thread, on account of the peculiar softness and compressibility of the cotton, and more especially so when the same is *lubricated* instead of being encumbered with wax. Then, again, the lubricated cotton requires only about half as much tension to do twice the execution in drawing the soles together.

Now, in addition to the fact of being able to use a larger cotton thread in the same sized needle, we so change the form of the needle itself as to materially increase *its* carrying capacity without enlarging its area, and in this way cause the

thread to more nearly fill the hole. This is accomplished by utilizing all the metal of which the needle is made, by *changing the shape* from a round to a triangular form. (See Fig. 8.) In this illustration, the enlarged cross section pre-

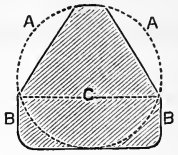


FIG. 8.

SECTIONAL END VIEW OF LASCELL'S PERFECTED NEEDLE. DOTTED LINES SHOW FORM OF OLD STYLE.

sents an end view of a needle cut across the middle. The circle represents the old style round blade, and the dark shading the improved. We take from the circle at *A A* and place the stock on the back at *B B*, thus giving all the additional size to the hook that is indicated by the extra metal on the outside of the circle at *B B*. In making the hook, the blade is necessarily cut more than half in two (say from the front down to the line *C*—see hook in side view of Fig. 6), and all that remains of the *round blade* for strength is *within the circle below the line C;* consequently the hook cannot be enlarged in the round blade needle, while in the improved form all of that superfluous as well as damaging metal at *A A* is removed and placed at *B B*, in order to enable us to get sufficient strength of hook both for puncturing and drawing in the stitch, and at the same time affording the opportunity to *enlarge the hook*. It is only by this means that a large hook can be made in a small needle, and thus we reverse the order of stitching in this respect by giving a small blade and large hook, instead of, as in the round needle, a large blade and small hook.

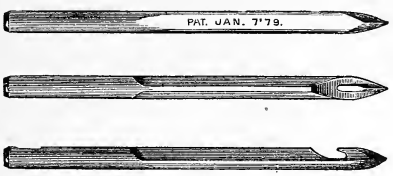


FIG. 9

REPRESENTS DIFFERENT VIEWS OF LASCELL'S PERFECTED NEEDLE.

Now, all that it is possible to accomplish with the old style round blade needle under the present method, we can do under the new process with a needle *one-half the size;* but this is not all. By removing the superfluous metal from the front of the blade, we have a narrow, V-shaped front which follows in the track of the hook in its downward passage, and comes through without any disturbance of the inner sole, leaving its surface smooth and even, rendering the beating-out process far easier. The thread being drawn into this V-shaped hole is held firmly while the beating-out process shuts up the hole, and pinches the thread still more tightly, thus supplying far more than an equivalent for all the holding force that wax has ever been supposed to confer, and this force is active so long as there is anything left of the shoe, whereas it will be remembered that, in the preceding chapter, we showed conclusively that when the shoe had become so much worn as to require wax to hold the thread, there was never any wax to be found on it.

As substantiating the truth of some statements, made in the previous chapter as well as this, relative to the superiority of the work made by the new process, it has happened that two tests have unwittingly been reported to the dealer there referred to. One was a pair of shoes bottomed on the McKay machine in the usual way, with linen thread and wax.

These shoes were made last November (1881), and, as they hurt the feet, they were worn but a few times, and laid aside and forgotten until recently, when they were brought in with the usual complaints and requests in such cases.

It was deemed the best and cheapest to take the bottoms off and last the uppers over again, and in doing so the workman began by cutting the stitches across the toe, and then with his thumb pried and pulled off the sole from toe to heel, breaking the stitches all along with but a very slight effort, showing that the strength of the thread had departed almost entirely, there being not to exceed three pounds' pull to the stitch out of the original seventy-five pounds; and this seemed quite remarkable since the shoes had not been worn any of consequence, and the wax was undisturbed, so that if wax had any tendency to *preserve* the thread (as some people suppose), that, together with the thread being surrounded or incased in leather (an additional help), it should have been impossible to have pulled the sole off by any ordinary means, as the thread should have possessed nearly if not quite its original strength.

The same week another customer brought in a pair that was made by the new process with cotton thread. These shoes had been worn almost constantly, and, in fact, the soles were worn entirely through in two or three places, but the uppers were so sound and good that it was deemed best to put on new bottoms. This afforded an excellent opportunity of comparing the strength and tenacity of the new as compared with the old method of stitching, as both pairs were made by the same concern and at nearly the same time. The stitches were cut at the toe as in the other case, but the workman failed to pry the soles off as in the former case, and was forced to cut the stitches all the way round. He said he had not strength enough to pull the soles off in the manner the others were done. Now both pairs, as stated, were made in the same month, and the lubricated cotton seemed to possess nearly if not quite all of its original

strength, while the waxed linen thread had retained but a very small percentage of it.

These telling little incidents occurring in the daily routine of business in a custom shop and retail store, are valuable proofs of the facts set forth in this series of articles, and when this matter of stitching is reduced down to the finest possible point of practical utility by the use of a lubricated cotton thread, drawn in by a needle of proper shape, by which it can be reduced to a size corresponding to the size of thread used — a needle having no surperfluous metal to damage the shoe by making a hole *six* times too large for the thread — then will shoe manufacturers begin to see the dawn of a new era in their trade.

CHAPTER IV.

MAKING DURABLE SHOE BOTTOMS ON THE McKAY MACHINE.

CLOSE SEWING.

In pursuing the subject of how to make a durable shoe bottom on a McKay machine, too much stress cannot be laid on the matter of close sewing, which it is impossible to obtain with the prevailing method of stitching. When a shoe is taken from the horn, it should be impossible to raise the insole from the outsole by lifting on the upper, or even by inserting the wedge end of the "long stick." Such sewing will not only keep the soles from working, but will exclude the dust, grit and gravel, which are so destructive of the thread not only, but of the upper leather also, causing the shoe to wear out prematurely. This has ever been the one great source of trouble, and whoever has used *very soft* wax has had the best success in this respect, as it comes nearest to acting as a lubricant, and causes the thread to run proportionally easy, and exactly in proportion to its ease of running is the seam made solid. We challenge any McKay operator to controvert this proposition, since we believe that his experience will confirm it, and in just so far as it is confirmed, is the position we have taken proven relative to the use of a lubricated thread. If wax was of the least possible service, we would give it all due credit, but since it is not only of no service whatever in a shoe bottom, but a very great detriment, as previously shown, rendering it impossible to make a tight seam, *it becomes our duty to denounce it*, and in doing so we beg to inform the reader that we have no friends to reward nor enemies to punish.

All the facts presented are self-evident, and should be made patent to all mankind whose interests may be promoted thereby, and our greatest fault lies in having withheld them so long, for they have been known to us for the past six years.

Our position may not be inaptly compared to that of a man who has found a pocket-book containing a large sum of money and papers of value, and is now endeavoring to hunt up the owner. If any of the papers therein contained should in any way seriously affect the interests of those engaged in making and selling linen, silk or wax, it is not our fault, nor can we favor them by abstracting any of the damaging documents. It is our business to deliver the pocket-book as we found it, with its contents undisturbed, and should our efforts in finding the owner result in making us known to some who had not known us before as needle manufacturers, and should it further convey the idea that we keep our eyes and ears open, and must necessarily have found out matters pertaining to needles as well as threads which enable us to make a needle better adapted for shoe work than we could otherwise have done, and it should lead to an increase of patronage; then and to that extent shall we have been lucky in our find, and possibly get a partial remuneration for the time we have devoted to advertising the said pocket-book. In thus defining our position we relieve the public of any necessity for studying out the motives which actuate us in the advocacy of cotton and paraffine *vs.* linen and wax, and enable them to devote such misspent time to trying the few simple and inexpensive experiments suggested in proof of the facts we present, and which are of the most vital importance for them to know.

We wish to say in this connection that we would go out of our way as far and spend as much time in the interests of those who manufacture linen, silk or wax, as of those who manufacture cotton thread or paraffine, and while it is a source of regret to be in conflict with any one's business in-

terests, and while we do not claim to possess moral virtues beyond the common herd, we can but feel that it would be almost criminal to withhold facts, the general knowledge of which would result in so great a benefit to the manufacturers and consumers of boots and shoes, gloves, etc.

FAMILIAR EXAMPLES ILLUSTRATING DURABILITY OF COTTON.

With the prevailing opinion that cotton must necessarily be so far inferior to silk or linen in any kind of seaming where great strength and durability are concerned, it may not be amiss to direct the attention of all interested in the subject to a few common-place matters familiar to all.

The shoe manufacturer who starts with a look of surprise at the mere mention of *cotton for sole sewing* or for the seaming of shoe uppers, never stops to think of the cotton threads composing the warp and woof of his shirt, nor of the cotton thread with which it is stitched, nor yet of the marvellous service it endures in daily wear not only, but the sweating and washing and rubbing and wringing and boiling and bleaching and ironing, and the same repeated week after week and month after month; whereas, if shoes stitched with silk or linen would endure half the hard usage they would be considered eminently satisfactory; and yet it is very evident that the nature of cotton undergoes no change from change of uses. Cotton thread in a shoe is the same as in a shirt or dress, and in whatever place it is put it is certain to prove the most durable of all the threads in use.

Ask any intelligent matron which of two every-day work dresses would wear the longest, one made of common brown sheeting, or one made of the heaviest of black silk, and she would say the former would outwear a half dozen of the latter.

No person need be led astray in the matter of threads, as in previous chapters we have given many simple suggestions illustrating some of them, in order that any one might,

in a few moments, test the truth of any of our statements for himself as to the relative value of the different threads. The most practical and valuable of these tests were made by Charles Goodyear, Jr., the inventor of the Goodyear Welt and Turn Machines. As previously stated, Mr. Goodyear became much interested in this subject over two years ago, and probed the matter to the very bottom, in order to satisfy himself of the truth or falsity of our statements, and, when asked more recently if he had adopted the cotton, he said no,* not because I am not thoroughly convinced of the superiority of cotton for either shoe bottoms or uppers, but, said he, whatever the superiority of cotton may be, it would require far more time and labor to convince the public of the real value of cotton than of the superiority of my machines, and, since the work done on them is so much better even with linen thread and wax than shoes bottomed on the McKay machine, I prefer not to trouble those with whom I am dealing with a matter that at first would seem to them to be very questionable. Since then I received the following letter from Mr. Goodyear:

BOSTON, MASS., *June 29, 1882.*

MR. LASCELL:

Dear Sir,—Since reading the article in the *Manufacturers' Gazette*, "Is Cotton King?" I have tried as impartial an experiment as I could devise by taking side by side, between the fingers, according to the cut you recently published, a thread of six-cord yellow flax and one of sixteen cord No. 20 cotton, and chafed away in the same spot (on the cotton), until I cut the flax six times clean off. The cotton was so little worn after passing it a few times between the fingers to lay the nap, it is impossible to tell at what point the chafing took place. In one respect this test was not, perhaps, quite impartial, for the diameter of the cotton being greater

* At this writing (May, 1884), Mr. Goodyear is using cotton *exclusively* and has been for a year past in his factory at Lynn, Mass., which is devoted to making sample cases of boots as tests of the superiority of his machines for making durable and flexible shoes. Uppers are sent here from all sections and in large quantites in many instances.

than that of the flax, the cotton naturally got the greater wear or friction, both being as close together as it was possible to hold them. As any manufacturer or person interested can try these simple experiments for his own satisfaction, they need not take your arguments or those of any of "the blind advocates of cotton."

Yours very truly,

CHAS. GOODYEAR, JR.

Now to those who are at all acquainted with Mr. Goodyear, this unsolicited letter and test will prove of great value as substantiating our position.

A PRACTICAL TEST.

Following the hints contained therein, I have endeavored to try a still more impartial test (in this at least) that I took a piece of six-cord 16 linen thread, which was larger than the cotton (sixteen-cord 20), and holding the two threads side by side, and as close together as possible (in the manner de-

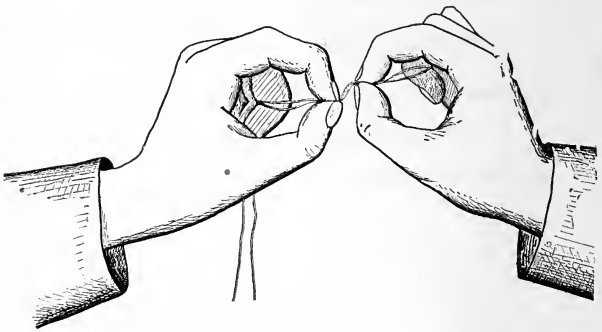


FIG. 10.

scribed by Mr. Goodyear), I began chafing the two between the thumb and forefinger nails of each hand, as shown by the above sketch, and in just four minutes I had chafed

the linen thread completely in two, and at the expiration of thirty minutes I had chafed in two eight linen threads. I parted the ninth thread in seven minutes more; the ninth thread consuming three minutes more than the first, was owing to the hands being wearied by the operation, and the movements slower. Every joint in my hands had become so painful that I was obliged to desist, leaving every strand of

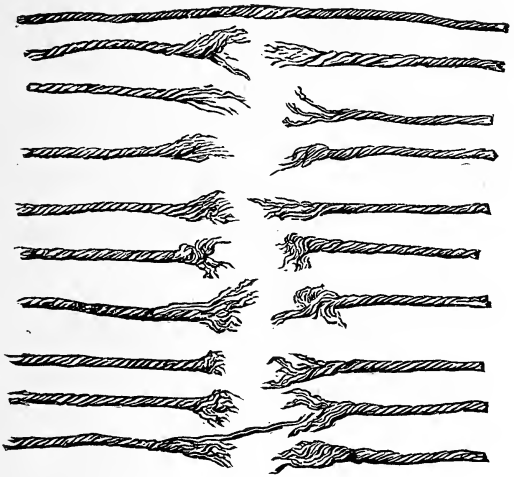


FIG. 11.

the cotton whole; and, notwithstanding the cotton was chafed in one spot all the time, yet it was not worn enough to make the spot easily distinguishable to one who did not know just where to look for it (after having restored the twist and smoothed down the nap). Now, if the linen had not been larger than the cotton, more than nine threads would have been worn in two in the thirty-seven minutes in

all probability, and just how many more would have been worn in two before the cotton would have worn out is of no great consequence, as this test proved that cotton will, at the least, wear nine times longer than linen, and for aught we know twenty-nine, thirty-nine or fifty-nine times. I gummed the cotton and linen threads to a sheet of paper, from which Fig. 11 was photographed.*

Now, from these tests very valuable hints to shoe manufacturers as well as manufacturers of clothing, may be derived in the matter of sewing on buttons, for if cotton will wear from nine to twenty times longer than linen thread, of equal size, no one will care to use linen, when they shall have ascertained that the tensile strength of cotton is all sufficient for that purpose. Linen thread comes about as near being entirely worthless (where it is exposed to friction) as can well be imagined, notwithstanding its tensile strength. If you go to your match-box and take out a match, and it proves to be a straight-grained piece of pine, you would find that its *tensile strength* would effectually resist the power of any two of the strongest men you can select; yet it would require all the sophistry of a Calvin or a Knox to make it appear that its fibre would stand any chafing, or prove to be of any service whatever as a thread. A hickory walking-stick, too small for a fop to lean upon, would have tensile strength sufficient to suspend a number of tons' weight, but it is futile to argue from such premises that a woody fibre, of however much tensile strength, is fit for a shoe thread, yet who ever heard of any shoe thread that was not linen. Linen, as everybody knows (or should know), is but the bark of a stalk, a woody fibre at best, and chiefly valuable where its tensile strength *alone* is required, as in the stays of a ship,

*There is a seeming discrepancy between Mr. Goodyear's test and mine, inasmuch as it took him fifteen minutes to chafe one thread in two, whereas, I performed a like feat in just four minutes. The explanation is that his motions were much less rapid and vigorous, and his finger nails much shorter than mine.

ships' cables, and like kindred uses, where it has nothing to do but to withstand a longitudinal strain. Now, when the woody nature of flax and hemp is considered, is it any wonder that it will not endure a twentieth part of the service that cotton will? Is it to be wondered at that your suspender buttons come off after being sewed on with tensile strength of linen sufficient to hang the man and pants too? We challenge the world to produce anything quite equal to the superlative nonsense of using a *wooden* thread solely on account of its tensile strength and which is the only merit it possesses, as the foregoing tests fully demonstrate.

CHAPTER V.

WAXED *VS.* DRY THREADS.

At this stage of the arguments on this question I found that the "*Boot and Shoe Trades Journal*," of London, England, had copied them, which awakened some opposition there, as under date of July 3, 1882, a Mr. Wm. Churchill writes to that Journal as follows:

"Having read in your valuable journal the remarks of Mr. Lascell on wax as a sewing agent, with your kind permission I should like to say a few words on the subject.

"Mr. Lascell says that if an old shoe, which has been sewn on the McKay machine, be examined after it has been worn down to the bottom of the channel, to the extent of wearing off the stitches, the thread will be found as dry and destitute of wax as it was when it left the thread mill. If Mr. Lascell found it so, then I say that the thread was not properly waxed in the first instance.

"It appears to me to be Mr. Lascell's opinion that it is impossible to sew solidly with the use of wax. His objections are that it clogs, rots and burns the thread, and he asserts that it is impossible to keep the thread hot enough, no matter how hot the wax may be, or how rapid the stitching. Another of his objections is that it besmears and clogs the needle, which it causes to run hard, and wastes.

"After many years' experience in machine and hand-sewn work, I can only come to the opinion that better sewing can be done with wax than without it. I mean, of course, good wax made from resin, pitch and tallow, well worked, and neither too hard nor too soft, although it is better to have it a little hard than too soft. Bad wax certainly makes bad sewing, but good wax makes good solid sewing; it assists the thread through the machine, strengthens it, forms an outside coating, which makes it waterproof, and acts as a glue, by sticking it to the leather, so that when the stitch is worn off in the channel the thread still adheres firmly to the

sole, welt, upper and inner sole, which would not be the case without.

"Mr. Lascell also states that one of the largest retail houses in Lynn, has, since last November, put out over 2000 pairs bottomed without wax, and the result has been all that could be desired. May I inform Mr. Lascell that I am acquainted with a retail house in London which has turned out over 30,000 pairs since last November, all of which were sewn with wax thread, and the result in this case also has been all that could be desired. The case is cited by Mr. Lascell of a pair of boots made last November, which had been three times clumped. Apart from the fact that this does not speak much for the wear of the boots, what would he say to a pair of heavy water tight boots lasting three years; they were, too, only clumped four times during the three years, and are still in wear. They were, however, sewn with Finlayson's ten-cord, well waxed, not four-cord. I doubt very much whether they would have stood so long had they been sewn with anything else."

Answering Mr. Churchill's statements in their order I would say: 1st, that it does not seem at all probable that he had taken a worn-out McKay sewed shoe bottom to pieces to ascertain the truth of my statements, as, if he had done so, he would probably have answered differently, if at all. Yet Mr. Churchill doubtless voices the opinion of every shoemaker in both Europe and America, when he says "I can only come to the conclusion that better sewing can be done with wax than without it," but that by no means disproves the anti-wax theory any more than a Turk's belief in the Koran disproves the revelations of the New Testament.

In speaking of wax he says, I mean good wax, made of resin, pitch and tallow, which he claims is better a little hard than too soft, and adds, 1st, that it assists the thread through the machine! Now if he means by this that it assists in contrast with a lubricant of paraffine or grease of any kind, then let him grease a few yards of thread and sew a pair, and if he finds that the greased thread drags and holds back and runs harder than a thread prepared with his good wax I will yield the point. But of course this is out of the range of

possibilities when stitching with the McKay Sole Sewing Machines, on account of being obliged to haul in the stitch next back of and by the power exerted in taking up the loop for the next stitch. To make the matter more clearly understood, we will suppose that we are sewing by hand, and we leave the stitch we are taking loose, letting the loop stick out half an inch, with the intention of drawing it in and forming a solid stitch by the force we exert on the next, and so on throughout the seam. From this it will be understood how difficult it would be to make as tight a seam as if our thread was lubricated, for it must be borne in mind that all the stitches taken by the above-named machines are pulled in to this great disadvantage as compared with sewing by hand, where one stitch is pulled at a time and tightened before taking the next. To add to the difficulty, the loose, long loop that has to be drawn in by the next has been held by the needle above the shoe, and completely cut off from the heat in the horn during the time the needle returns and loops up the next. In pulling up this next loop the cooled thread has to be drawn in to form the stitch; hence it necessarily follows that the larger the needle hole, and the hotter the room and the softer the wax the less friction in drawing in, and consequently the more firmly will the outer and insoles be drawn together; and the more firmly they are drawn together the less liability there is of the soles working and cutting off the threads between them, which is so commonly seen in McKay machine bottoms.

Now, every McKay machine operator may come to understand that as stitching is now and has been done on that machine the large needle hole, the hot room and the soft wax are important factors in making "solid" stitching, all of which oppose Mr. Churchill's "good-wax" theory. These conditions are *every one of them* indispensable, and to the extent that this is seen to be true should be the desire of all to get rid of them. To this end the first inquiry should be as to the importance of wax. This can be best ascertained from

dissecting worn-out shoes. First, find some wax. Second, ascertain the quantity and quality of it as compared with Mr. Churchill's new good wax. These investigations may lead Mr. Churchill into the path to a fortune by suggesting some new ingredients that will materially improve it, in case he should fail to find any of his good wax in worn-out shoes. It must be borne in mind in this connection that wax is an article of commerce, which, by universal consent, has not been deemed susceptible of improvement or change for the better.

Mr. Churchill also says that wax *strengthens* the thread; but just how or to what extent we are left to conjecture. I can not conceive that wax can possibly add any more strength to the thread than clear water or a solution of gum tragacanth would do in laying the fibres that may be sticking up on the surface of the thread, which, if laid down, would add their mite to its strength. And as to wax forming a water-proof coating, the extent to which this is true may be readily ascertained by soaking a few waxed ends in a pail of water, or its water-proof qualities may be seen to the best advantage, perhaps, in the shoe that has been worn a few weeks, should you be fortunate enough to find any spot on the thread where the wax adheres, and at the same instant you will discover the purpose that the wax thread serves in holding the thread in a needle hole that is at least six times larger than the thread when the stitching has been done with the old-style round blade needle.

In speaking of the large retail house in Lynn having put out over two thousand pairs sewed with cotton and paraffine which proved "eminently satisfactory," I should have added, *as tests of the value of the new as compared with the old method*, while most of the manufacturers in Lynn, some turning out on an average twenty cases per day of sixty pairs to the case, would doubtless say their goods were also eminently satisfactory (especially as compared to paying the extra cost of hand work), and they will doubtless continue so to ex-

press themselves until they get their eyes open to the possibility of making better goods without wax. As to the heavy "water-tight" boots lasting three years. I should say that as such boots are put together in London (superbly sewed and nailed), and worn only when "water-tight" boots are needed, they might last me three years or possibly three score years. Extra good boots may be made in Europe or America, and neither prove nor disprove the importance of wax, which has a value or it has not. If it has any real value, old shoes will best enable you to determine how much.

CHAPTER VI.

HOW TO PREPARE THREAD FOR SOLE SEWING.

SINCE the publication of the preceding chapters many inquiries have been received as to paraffine—what it is, and how to use it.

Paraffine is a product of petroleum, and may be found in places where paints, oils, and drugs are sold. It is run into cakes 16×20 in size and about an inch thick, and very much resembles camphor gum for beauty and purity, as may be inferred from its appearance in the form of wax candles; the cost of it fluctuates somewhat as does the crude oil.

On account of its *hardness*, paraffine is peculiarly well adapted as a thread dressing for use in sole sewing, as it stiffens the thread so that when the loop is cast off the hook it will stand like a waxed thread. The lighter the coat the better, until you exceed the limit of stiffness necessary to make the loop controllable. In trying an experiment, strip off all you can. The thread should be run through the waxer the same as in dressing linen thread with wax, having first cleaned the wax out and substituted paraffine. To strip the thread sufficiently dry you will need to lay a string or a piece of six-cord linen thread in the stripper to contract the aperture through which the thread passes. A successful experiment in stitching cannot well be tried by stopping the machine and winding a sufficient amount of thread on the spool for a pair or two of shoes, as in that case the machine will be *warm* and the paraffine so softened as to require slow and careful stitching in order to accomplish your purpose; and to try the experiment with a cold machine necessarily clogged with wax would be quite as bad, possibly, as the ma-

chine would not only run hard and stiff, but strain the whirl gearing, and perhaps break it. To stitch satisfactorily, you need to thoroughly clean all the moving parts, and oil them well with (we should say) crude petroleum oil, which, having all the kerosene properties in it, will never gum, and for this reason this oil is far better than any other (however much refined) for all sewing machines, both "wax and dry thread," and for all swift-running journals as well, but care should be taken to select such as has had the grit thoroughly strained out, which may be ascertained by rubbing a drop between the thumb and finger. This oil costs from thirty-five to fifty cents per gallon; and we would rather have one gallon of it than ten gallons of any other which is used ordinarily on sewing machines.

A McKay machine thoroughly cleaned and oiled will run cold with a lightness and freedom that will astonish the operator; and as the work with lubricated thread is comparatively light, the machine will not get out of order as formerly, and as to cleanliness, a borrowed operator from a neighboring shop said, after stitching a few pairs:

"I could stitch here all day in white kid gloves and not soil them."

From hints above given it will be seen that all experimental work *under wax conditions* must necessarily prove unsatisfactory. With proper care a few pairs may be stitched with a warm machine as test shoes, but you can never know what it is to stitch rapidly and well until your machine is put in order for being run *cold*, and the adjustments made that are necessary to the change of conditions. It will be found quite important to use the smallest needle possible, the whole theory of which was fully set forth in Chapter III, which should be read in this connection.

Cotton thread will be found to be much more elastic than linen, and *being lubricated*, as the needle lets go of the loop, it is inclined to slip back a little, and become shortened; con-

sequently, it becomes necessary to adjust the machine so as to pull up the loop enough longer to compensate for it. The amount of pull back depends on the size and shape of the needle, and the amount of tension employed in drawing in the stitches. In Chapter III, we described the form of needle necessary to use in any case, but more especially in the use of a lubricated thread, and we will send samples of them to any one wishing to test them, if they will kindly inform us as to the size of round needle they are using, or send sample of the thread they wish the needle to carry.

To the question: "Where can we get cotton for sole sewing?" we reply that thus far we have furnished it for experimental use, and to a few who have adopted it permanently. In this incipient stage of its use, it seemed quite important to procure the best thread that could be made from pure Sea Island cotton, and consequently we have supplied this want, and now deem it best to continue to do so, and at manufacturers' prices, to all who may apply, and for experimental purposes we will send it all ready prepared for use, together with the proper needle for such purpose.

The cost of stitching a case of shoes with the best Sea Island cotton will cost no more if as much as with linen, as the cotton being so much lighter, it has one-third more yards to the pound, and besides, it will stretch about one-sixth in sewing. Then, in the use of paraffine, the expense of a constant blaze in the horn is saved, as well as a noticeable difference in cost as between paraffine and wax, in favor of the former, so that when all are taken together the cost of stitching a case of shoes with the best Sea Island cotton and paraffine is less than with linen and wax.

The question has several times been asked, why linen will not work as well as cotton if dressed in like manner, and we answer that for aught we know to the contrary it will. The only question will be as to the smoothness of the linen, and the paraffine affording a sufficient coating to prevent its roughing up, etc., which can easily be determined by a trial

according to the directions above given. Certain it is, however, that a linen thread coated with paraffine will serve a much better purpose in a shoe bottom than it ever has done with wax, inasmuch as the stitching will be far more solid, with much less tension, provided your needle-hole is of the proper shape and size. A six-cord thread usually used in an $8\frac{1}{2}$ round blade needle, may be carried (under the conditions described in Chapter III) with a Lascell patent needle of less size and with proportionately less damage to the upper and sole leather, but it is only on account of the erroneous notion that great tensile strength is needed that any one would cling to linen, especially after seeing the tests illustrated and described in the previous chapters.

And now, I wish to have a word with Mr. A. S. Canham, another correspondent of the London *Boot and Shoe Trades Journal*, who, like Mr. Wm. Churchill, simply gives his "opinion" regarding the importance of wax, and in giving his opinion he but echoes the opinion of every other shoemaker in England doubtless, who has used wax from boyhood without question, and thinks he knows just what he is talking about and of course rushes into print, regardless of the possibility of his ever being able to learn anything to the contrary. He says my "remarks would be amusing if it were not possible that some would be misled by them." I might make another amusing remark, none the less truthful than my remarks on the wax question, to wit: That in the month of April of this ever-memorable year, 1882, the water in all this region of country got on a rampage, and millions of barrels of it run right up perpendicularly from the ground to the very tops of the highest trees, producing a transformation truly wonderful to behold.

Now as to this statement being true, I say as I did relative to the wax matter, *the truth of it is susceptible of demonstration*, but lest some one deeming it important to guard the public against being led astray by such nonsense (?) should hastily print a denial without previous investigation, I would

state that certain members of the F. R. S., of London, also know the facts to be substantially as stated.

If Mr. Canham seeks to prove that flax will not rot rapidly with a coating of good wax, let him use a thread tester on a freshly made thread, stitch a boot with it, and after the boot has been worn one month or six months take the boot to pieces and try the strength of the old thread. If he finds twenty-five per cent. of the original strength after one month, or ten per cent. after six months wear, I will make him a present of a pair of English-made ten-dollar boots.

Such a test will show just how much inportance attaches to his remarks under that head. The test may be made more cheaply by stitching two pieces of sole leather together, and laying them out on the roof, or in the shade. Make two rows of stitching with the same size and kind of thread, let one seam be made with a thread well waxed, and the other coated with a piece of paraffine (wax candle), simply to prevent the thread from wearing in stitching, and you will have the means of *knowing* which method has best preserved the thread as well as the importance of wax as a preservative.

The making of "good wax" was contemporaneous with plowing the ground with a heifer harnessed to a root. The former still holds the first rank in the most enlightened countries, while the latter has become obsolete and can only be seen in use amongst the uncivilized, if at all.

Mr. Canham refers to

"The old method of stitching the jockey boot heel on directly through the face of the rand. After the heel was built, the head of every stitch, he says, was chafed off with the rand breaker and the face set with gum; yet, although the boot-jack was often used, I never saw one such heel give way."

Now we submit that if the top of every stitch was chafed off with the stitches sunk into the rand as the sewing on of

a heel would necessarily involve, then there would be but a very little of the *rand* left for any purpose; but if the rand breaker was simply used to make a level surface (as seems most probable) the full tenacity of the stitch would be preserved. Then again no account is made of the *pegging on of the heel lifts* (more or less), nor yet of the fact that when a man uses a boot-jack he jams his heel into it opposite the middle of the counter, and besides, Mr. Canham's observations must necessarily have been exceedingly limited as compared with the vast number of such boots worn.

He continues:

"It was the same with fore parts; channels were only just cut long enough to cover the stitch, and the heads of these were soon worn off; but where the work was properly done, the sole seldom, if ever, came undone."

Mr. C. seems oblivious to the fact that where they do come "undone" the thread never draws back out of the hole, leaving it open and free to insert other stitches, but the thread remains in both the sole and the welt, and that the stitches are literally *cut* off by the movement of the sole against the welt, as every cobbler knows who has occasion to repair them; he has either to pick out the old stitches, or sew through or between them, and the same would be true whether the thread had been waxed or not, especially where the sewing is done with threads so much larger than the awl holes into which they are so forcibly pulled.

It should not be forgotten that in the discussion of this wax question our remarks have been confined to the use of wax *in Blake or McKay machine work*, and in this connection we quote a few lines from Chapter III, which are also applicable to hand work, so far as the liability of the stitches "becoming undone" is concerned.

"Again, wax is entirely superfluous in holding a McKay stitched bottom, for the reason that the stitches wear off

only in spots. It is not one time in ten thousand that a shoe sole is worn so square and level as to wear the stitches off all along the sides from shank to toe simultaneously, if, indeed, such a thing was ever known to occur. You will generally see a space of an inch at the ball, outside or inside, and either side of the gap the stitches not being worn off hold independent of wax, and at either side of the space the thread has too far to travel (in the loop stitch) to work itself out so as to enlarge the gap.

Whatever tendency you might imagine existed for so working out, you will find, nevertheless, that the stitches stand in place like so many pegs awaiting their release by the cobbler. What folly, then, to look in that direction for the difficulty, when it is always found *between the sole and the upper*, and that is where the average idiot might know that wax was useless."

Mr. Canham further says:

"I am well aware that the present system does not require the same strength to hold the sole and upper together as did the old; the beveled edges and diagonal position of the welt seam, the insertion of hard shanks and many layers of bottom filling, rendered the stitching a work of immense importance; *it was like binding together a bundle of pieces every one of which exerted friction on the band*, and it was only by keeping the seam or thread perfectly rigid that it was held together. This may appear strange to the advocates of elastic seams, but it is nevertheless correct, whilst at the same time there was far more elasticity for easy wear than can be gained by a tight sewn loop stitch seam; for in this there can be no yielding, as the stitches are held by a kind of staple link, stitch to stitch, along the whole length of the boot, unless the thread works on itself with a fiddle motion, which would inevitably destroy it. I do not mean to say that this kind of work will not stand, for I have seen it answer admirably, but that does not disprove my statement. In hand and lock-stitch sewing every stitch is a joint along the stuff, and motion along the line produces but little if any strain on the thread. The question has been asked, why, if it is necessary to wax threads, should not pegs be also waxed? The idea is

ridiculous to a practical mind; before using, the peg is dried to the uttermost, so that shrinkage afterwards is impossible: the leather is also used in a somewhat dry state and the awl is only about half the substance of the peg, so that when properly driven home and the point roughed on the inside, and the outside properly filled over, it is not only severely compressed, but riveted on both sides, so that withdrawal is impossible. To argue against wax is, in my opinion, a waste of words, if nothing worse: athough if present circumstances render its use an impossibility, then to explain a system that is satisfactory without it, will certainly advance the interests of the trade."

Answering the first item, I fail to see that bottom filling that comes just even with the top of the upper leather lasted over should be at all as described, as, in fact, the bottom thus filled must necessarily be easier on the thread than without any bottom filling; and just how the bottom filling, much or little, could come in contact with and render extra solid stitching necessary on that account, is one of the mysteries that a shoemaker, sixty years old, fails to comprehend. That such very solid sewing should be more elastic than the loop stitch I can readily understand, *especially where wax is used.* Nobody would think of finding a McKay sewed bottom as flexible as *hand sewed*, and such will never be the case, until they either do away with wax, or stop sewing through the inner sole. But when you lubricate the loop, in place of waxing it, you have the most elastic stitch, and consequently the most elastic seam that it is possible to make.

How it happens that "the hand stitch becomes a joint along the stuff" is another mystery, but that the so-called "lock stitch" (?) *does* in a measure, is more clear, and it is also as clear that the *joints suffer from enlargement.*

As to pegs, I am aware that they are well seasoned, and that when wet will swell, and that the shrinkage of the sole leather tends to enlarge rather than contract the hole into which the peg is driven. I also know that it was never practicable to drive a peg into so small a hole as you could draw

a like bulk of thread into, and that as a rule the awl-hole is much more thoroughly filled with thread than with peg-wood; and consequently, if wax is indispensable in the one case it must be equally so in the other.

That pegs are thoroughly dried I am aware, but that their being so prevents their absorption of moisture before or after being used, and therefore renders them not liable to shrinkage, is a statement no less questionable than the other statement, that when driven, they "are so *riveted* on one end and filled over on the other" (or as he says in the same breath), "*riveted on both ends*," and severely compressed so that "*withdrawal is impossible*," is quite novel, to say the least. I well remember, that when an apprentice, I was taunted by my shop mates with "*riveting my pegs*," the battered ends of which had to be rasped off in order to make a decent-looking bottom; but had I known *then* how important "riveting" was, and that with all such *riveted pegs* "*withdrawal was impossible*," I could have turned the laugh upon the journeymen, who prided themselves on pegging so smoothly that the grain *of the sole-leather* had seldom to be scratched with the rasp, or shaved off with the knife in order that the diamond-shaped end of the pegs could be seen in all their symmetry.

Now, when we leave the old seat, and go to one of the modern pegging machines, which will put a row of pegs around a boot in from six to ten seconds, with an awl more nearly the size of the peg than in hand made, you have a quality of work quite unexceptionable so far as durability or beauty is concerned, and which completely upsets Mr. Canham's conceited flourish regarding the question of waxing pegs as well as thread to make them hold.

It is to be regretted that no one on this side the ocean has seen fit to offer anything in opposition to the use of cotton or paraffine as substitutes for linen and wax, and it may, perhaps, be accounted for in the fact that improvements in every direction succeed each other so rapidly in America that

any suggestion, however strange, gets a respectful hearing; or perhaps they are making experiments which may serve as a *basis* for an opposing argument, *or future action.* Certain it is, however, that many are investigating this subject, and hundreds of pairs of test shoes are now being worn.

The writer was in the city of Rochester, N. Y., on the 15th of August (1882), and while talking with one of the proprietors of the largest shoe manufactory there, the subject of wax came up. He showed me the inner sole of a shoe (one of a pair he had brought for the purpose of dissection), and said in ripping the shoe to pieces he could not find a particle of wax, and the shoes were fresh and new, never having been worn. He said they looked as if they had not been off the last over a month, but there was nothing to indicate their exact age, and he could not say that they had not been made three or even six months; but certain it is that there was no wax to be found, although the inner sole showed the stains or marks indicating where the wax had been. This concern, averaging to turn out 20 cases of shoes per day, of 60 pairs to the case, have now abandoned both linen and wax for sole sewing, as they had four years previously abandoned silk and linen for cotton in seaming shoe uppers. Their abundant success in the latter led them to an immediate investigation of the cotton and anti-wax theory in sole sewing, by making test shoes, and the result is as above stated. They have made the change with a promptness and a degree of assurance that contrasts strangely with mere opinions, as expressed by our would-be critics from across the ocean, who, if they would say "whoa" to their heifer, and take a look over the fence and see a team of horses hitched to a modern steel plow, they might possibly be induced to at least stick a knife down into the sod, by way of experiment.

There are two or three uses for wax: one is to draw inflammation from a wound, sore or boil, another is to seal corks in bottling wine or cider; and it is not to be disputed that it protects a linen thread and enables a shoemaker to use

up a thread by frequent waxing without wearing it literally to pieces, as would be the case without waxing; for there is no kind of thread that will not stand more friction than linen, and as to the original value of wax *as found in the ball*, it is very doubtful if it was ever burned so badly in the kettle as it is in the awl hole when drawn through as rapidly as it is often done. If you would get an idea of this, wax a thread well and squeeze it as tightly as possible in the hand, and then draw the thread rapidly through it, and if your experiment is a *successful one*, you will find your skin seared as with a hot iron. Now this may suggest a reason why the welt of a boot often cracks off prematurely. The most probable reason is that it is *burned off*, and that if you had used paraffine, or even beeswax, neither your thread nor your leather would have been injured. I am not prepared now to say to what extent this may be true, but I deem it a thought worthy of consideration at least. It is very well to admire a ball of "well-made, golden-hued wax," but it by no means follows that you have the same quality in the stitch when *drawn in*. If it was possible to gather a ball of such wax and present it to Mr. Canham he would say it was wholly unfit for use. When a shoemaker draws off a thread of two lengths, it will measure ten feet from end to end of taper, and in stitching a sole to a welt half an inch would be taken up to each stitch. Now, if you leave "waxed ends" each a foot in length, then the thread forming the last stitch shall have run the gauntlet of fire with lightning rapidity just one hundred and ninety-two times, the average being ninety-six. Here is necessarily a transformation from the golden-hued ball to—what? will Mr. Canham rise and explain?

Now a dry or greased thread drawn into a hole half its size (as in hand work), will hold equally well, and if any ripping (?) occurs, it will be the same old style of the cutting off of the thread between the sole and welt, while the stitches will ever be found in both sole and welt undisturbed. *Wax* is *wax* until you subject it to a *burning friction* from one to one

hundred and ninety-two times, which ruins it; and so *needles* are *needles*, and a poor one will as certainly wear you thread out, as friction will burn all the life out of the wax. When a man buys a silk that will pull ten pounds, he thinks he has got that ten pounds' strength in the shoe, but such is by no means the case. The strength of the thread *in the shoe* depends entirely on the quality of the needle used, and when a man thinks he is buying needles very cheap, "he is paying very dear for his whistle."

CHAPTER VII.

WHY IT IS IMPOSSIBLE TO MAKE AS SOLID STITCHING WITH WAX AS WITHOUT IT IN SOLE-SEWING.

In the elucidation of this subject, I will, also, answer Mr. Churchill's latest effusion as published in the London *Boot and Shoe Trades Journal* of September 2 (1882). Mr. Churchill has probably failed of getting more than brief extracts from the matters contained in the foregoing chapters; for had he seen my answer to him in full, and improved upon the hints therein contained, he might have proved for himself the utter fallacy of his position, unless he writes simply for the purpose of "*disputation.*" We thank him, however, in any event, and he would have laid us under further obligation had he stated the manner in which the tests referred to were made. We quote his letter in full in order that the reader may comprehend fully our comments.

WAXED *vs.* DRY THREADS.

"Having disputed Mr. G. W. Lascell's previous statements through your valuable journal, I should like, with your kind permission to reply to that gentleman's last letter, printed in the *Boot and Shoe Trades Journal*, of August 26 (1882). Mr. Lascell has failed to prove that boots are better sewn without wax than with it, and now he attempts to prove that soft wax is better than a moderately firm one. The Blake and Goodyear Machine Company formerly used soft wax for their welt and stitching machines, but now they use hard wax, which they consider a great improvement, as they find it adds to the strength of the sewing. So far as Mr. Lascell's remarks on the working of the McKay or Blake machines are concerned, I can but think he has been misinformed, or he would hardly have put forth such statements. In the first

place, the machine sews so rapidly that the needle gets hot, and the thread passing through the needle has not time to get cold as he represents; nor does it require a large needle, hot room, or soft wax to make good sewing.

"Mr. Lascell must surely have seen the advertisements of sewing machine manufacturers and sewing machine sellers, in which they state that their machines work with hard wax, claiming this as an advantage over those that work with soft wax only, which has long since been condemned as a sewing agent. Although Mr. Lascell states that he cannot conceive that wax can possibly add any more strength to the thread than clear water or a solution of gum tragacanth would do, by laying the fibres that may be sticking up on the surface of the thread, and which, if laid down, would add their mite to the strength, yet I think if he will do as I have done, and test the difference of a thread not waxed and a thread properly waxed, he will find that the latter will bear more tension than the one not waxed, while a thread waxed with an oily, soft wax will not bear half so much tension as a thread waxed with a good, firm wax. This I think is a sufficient proof that wax strengthens the thread."

First then, Mr. Churchill says: "I have failed to prove that boots are better sewn without wax than with it."

In answer to this I would say I have not made a statement that I had not learned the truth of years previous to its publication. My first experiment in sole sewing with a lubricated cotton thread was made in 1878. One shoe of the pair was sewed on the McKay machine with a cotton thread that had been previously soaked in melted tallow, the other shoe was stitched with a linen thread and waxed in the usual way. The former was always flexible and comfortable, and wore out the sole and a pair of taps, while the other ripped within four months. I have been wearing test shoes in this manner ever since. On one pair I used boiled linseed-oil with like good results. Some three years ago, Charles Goodyear, Jr., the inventor of the Goodyear machine (that Mr. Churchill refers to) kindly offered to bottom a pair of uppers for me. I furnished a ball of tallow stiffened with twenty-five per cent. of beeswax with which to do one shoe, and

gave him the privilege of doing the other with wax. I directed Mr. Goodyear to use much less tension on the tallowed cotton-thread than upon his waxed linen thread. Mr. Goodyear conducted the experiment in person. The shoes were made as directed, his shoe being sewed with good wax and as solid as possible. The pair was finished and exposed to the sun in his office window for a week, when he made the discovery that the shoe sewed with cotton and about half as much tension as was put upon the waxed thread, showed no crack between the sole and welt, while the solid sewing with wax did. Mr. Goodyear then hastened to Lynn with the shoes in hopes of getting a solution of the mystery, which was solved as we shall show further on. Mr. Goodyear became much interested in the matter, and we supplied him with cotton sufficient to make a pair of test boots for himself and his sons, and while those were being made he became impatient for results and devised a more speedy way of testing the value of cotton as compared with linen, which ingenious devices are illustrated in Chapter II. Mr. Goodyear had been seeking to get rid of the cracking of the finished edge, exposing the joint between the welt and sole, and my pair of test shoes made on his machine furnished a solution of a difficult problem. Now we offer this in proof that more solid sewing can be done without wax than with it, while it required much less tension.

Ever since the advent of the Howe stitching machine, probably nine hundred and ninety-nine out of every one thousand pairs of shoe uppers have been stitched with *dry* thread, and mainly with silk (the most slippery of all threads), and if wax is important anywhere, it is much more so in the upper than in the sole of a shoe. As previously stated, the real value of wax anywhere is to be determined by its adhesive qualities *at the time the stitches are worn off*, so as to require its auxiliary aid in holding the soles from coming apart, and if at that time it is possible to find any wax at all (hard or soft) then is the time and the only time

to test its *holding* qualities, for *until then*, however good the wax may have been, there could have been no possible use for it, as the *whole* stitches held without it, and while the shoes were comparatively new, wax was quite detrimental in causing the bottoms to be unnecessarily stiff and inflexible.

The Goodyear machine is better adapted to carry hard wax or soft wax (or no wax) than any sole-sewing machine taking the loop stitch, for one reason among others, that a wax tank located near the needle forms a part of the machine, and the thread passing directly from the boiling wax to the needle with but a short intervening space, and that space being hot also, the wax serves a much better purpose as a lubricant, as it is not subjected to the same chilling effect of surrounding atmosphere as in the McKay.

While Mr. Goodyear fully endorses the cotton thread and anti-wax theory, yet he cannot afford to oppose any person's prejudices in favor of the use of linen or wax.

When Mr. Goodyear found the tallowed thread with only half the usual tension had drawn the sole to the welt so solid as not to show the crack in the edge between them, after the shoe had become seasoned, he set about making a substitute for wax by putting rubber in the place of resin. Some such composition he thought might furnish sufficient adhesive quality, while it might at the same time act as a lubricant. At that time (some three years ago) he was fully imbued with the supposed importance of wax, and hence he sought for an *adhesive* substitute, but he soon saw that to oppose the time-honored use of wax, and the universal prejudice in its favor, would cost him a much greater effort than would be required in the introduction of his machine. As his machine was provided with greatly improved facilities for the use of wax. and therefore having nothing to fear from competitors, he wisely concluded to make no stir about it, but let anybody else who chose, work out the anti-wax millenium.

In this connection I wish to notice Mr. Churchill's closing remark, to wit:

"A thread waxed with an oily, soft wax will not bear half so much tension as a thread waxed with a good, firm wax."

Now, unless we put a wrong construction upon that sentence, he expresses an important truth, and just what we are contending for. We do not think he means to say that a thread dressed with a "good, firm wax" is *twice as strong* as the same thread dressed with "an oily, soft wax," as such a statement would not only be exceedingly foolish, but absolutely false as well as a glaring inconsistency. We, therefore, interpret this sentence to mean just exactly what the words imply, and proceed to illustrate the truth of it by the following sketch. We here show a shoe being stitched on the

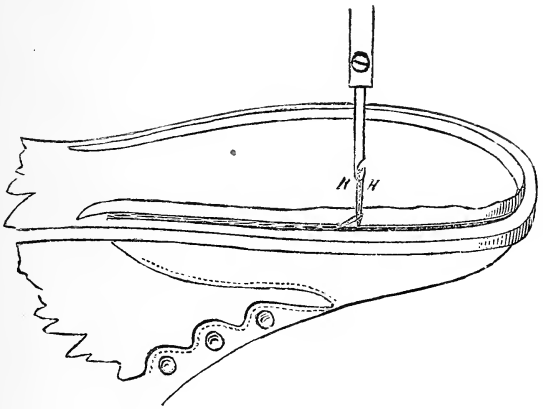


FIG. 12

REPRESENTS A SHOE BEING STITCHED ON THE HORN OF A McKAY MACHINE.

horn of a McKay machine. the needle having risen to nearly its highest point, and by its lift on the loop *H H* is drawing home the preceding one. In the next sketch the needle has

cast off the loop *S S*, and is returning within it to the inside of the shoe to hook up another; and during this operation *that loop* is left standing, with the soles of the shoe between it and any heat from the light in the horn, and the wax, if "firm," becomes more or less set, and will require a tremendous pull to start it in motion at all, and much more to cause it to be, drawn down as tight as it requires to be in order to bring the outer and inner soles together sufficiently solid to prevent their working and cutting off the thread, as usual. If, however, the wax is of the "soft and oily" kind, the same tension exerted in the first instance would cut the leather completely in two between the needle holes. Hence it is that one-half the usual tension, if exerted on a *lubricated thread*, will do far more execution in drawing the stitches in solid, while with the "firm" wax it requires much more than either the needle or thread will stand to make the same sufficiently solid for anything like medium durability, notwithstanding the fact that the hole made by a No. 8 needle will admit *twelve six-cord threads*, such as are usually used in sewing with a No. 8 needle. We proved this conclusively by a simple experiment. (See illustration on page 26.)

Now, as shown, there is a very great disparity between the size of the hole made by the needle and the thread that is drawn into it, and but for this difference no sewing could be done with a waxed thread on a McKay machine, owing to the necessity of starting and pulling that standing loop *S S* in by the pull the needle gives to the next loop when it rises again. (See Fig. 13.)

If Mr. Churchill was sewing by hand, and having made a fresh thread should give it one pull and then stop long enough to light his pipe before completing the stitch, he would fail, perhaps, in starting it again, and he would hardly be guilty of taking *another stitch* to start the *former one* with; but this is precisely the way in which every stitch is taken by the McKay machine, and hence it is that the *large hole*, *soft*

wax and hot room become indispensable in stitching a tight seam. The idea that the *needle* gets sufficiently hot to warm the atmosphere surrounding the *standing loop* and keep the wax melted, is rather far fetched to say the least, since it does not stop long enough for heat to radiate; and in any

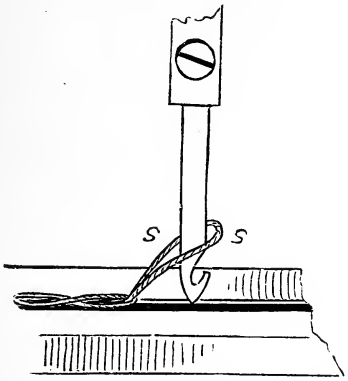


FIG. 13.

event such a mere trifle of heat would be fanned away by the rapid motion of the needle bar. Besides, when the loop is required to move, the needle is half an inch above it, where its heat could by no possibility be imparted to the loop when it was being drawn in. (See Fig. 12.) Mr. Churchill says the thread passes through the hot needle so rapidly that it has no time to get cold. Now when the thread passes through the hook, the latter is on its way up, and when it gets up to its highest point, it stops, and returns for another loop, leaving the first one standing and waiting in the cold atmosphere of the room for the return of the needle to pull it down. Had Mr. Churhill said that stitching was done so rapidly that the wax had no time to chill, he would

not have betrayed his ignorance of the workings of the machine, and his remark would have been well worthy of notice, for although wax chills *instantaneously*, yet it becomes less and less *chilled* in proportion to the rapidity with which the stitching is done. It could never be done so rapidly, however, that the wax would not chill in a draft of air, even in summer weather, with the mercury at 80°, and this would be more emphatically true with Churchill's "*firm* wax," on which he lays so much stress.

As previously stated, it is only after the sole has been worn down to the bottom of the channel that wax can possibly serve any useful purpose, and it has been already proven that *then* no wax is present.

The shoe manufacturer finds, therefore, that he has put up with a great deal of nastiness, and besmeared and blistered the feet of his patrons, besides subjecting himself to the cost and mortification of having his goods fail prematurely, or turned back on his hands, all for the nonsensical notion that wax is important, when it is susceptible of demonstration that it is not only *absolutely worthless*, but very detrimental, and especially so in sewing with the McKay machine.

We do n't take all this trouble so much for the purpose of answering Mr. Churchill as to call the attention of shoe manufacturers to the importance of this matter. The great disadvantage with which the McKay machine draws in the stitch renders waxing a very costly process, on account of the various ways in which manufacturers are subjected to needless losses, expense and inconvenience.

For the purpose of illustrating the theory of the stitch more clearly, let us hitch a good team of horses to one end of a soft, flexible rope, and set an 8×12 inch post in the ground, such post to represent the shape and proportion of the leather between the needle holes. Now we will wind the rope once around the post, and station a man of ordinary strength at the other end of the rope to hold as against the draught of the horses. He may easily defy the team to start

the rope or pull it out of his hands. We will now give the rope a good coat of Churchill's "firm" wax, and substitute a small boy for the man, and the former will be able to hold the rope with one hand as against the team. Now let us build a fire around the post, so as to melt the wax and cause it to act as a *lubricant*, and the team will walk right away with both man and boy. This heat around the post is just what the McKay and other kindred machines are provided with, but unfortunately the shoe comes between the fire and the thread, cutting off the heat just at the point where it is most needed, which is like removing the fire to a point just aft the post, and then setting a high board fence between the fire and the man, with an auger hole in the fence to pass the rope through. The wax is melted as the rope passes over the fire, thence through the hole in the fence, and then it comes to a dead stop, and in a comparatively cold atmosphere, while the team is backed up to get a fresh hold. Again see Figs. 12 and 13, in which the needle represents the team.

Now, the thread stands still just half the time, *and that, too, on the wrong side of the fence*, where the atmosphere is chilling. And to start the thread in motion again after it has stood until the wax has become more or less chilled taxes the needle, thread and machine to the utmost, causing an unnecessary waste of needles, machine parts, and the use of a much larger thread than is needed. The worst of all, however, is that sluggish movement of the thread which makes a slack seam as compared with a lubricated thread, and when it is found that all that manufacturers have suffered in years past on account of soles ripping, is directly traceable to the use of wax, they will seek with avidity the substitute we are now advocating.

There is nothing in the making of a shoe that requires more of scientific attention, care and watchfulness than the wax; it is extremely sensitive and susceptible to change by the slightest variation in the temperature of the stitching

room. The stitching commences at the blowing of the whistle and then all is cold and stiff, and you get a very different quality of shoe from that done an hour or two later, when the room has become thoroughly warmed and everything as hot as possible about the machine. Hence it is that manufacturers have seen some of their shoes fail in which the same size and quality of thread was used and stitched on the same machine, and by the same workman, and the same number of stitches to the inch, as others of their make that stood well. To use wax safely or to have uniform work *a uniform temperature is absolutely indispensable*, and to get this every factory should have a separate room partitioned off for the sole sewing, and the heat should be regulated at whatever temperature the wax requires, and should be kept steadily at that without the variation of a quarter of a degree as indicated by a good thermometer. If 95° is too hot for the operator then let him temper his wax so that 75° will answer as well; shoes stitched under such conditions would be uniform; and if one customer complained of soles ripping off, all ought to, and if all complain, then soften your wax or *fire-up*, or what is more sensible discard wax altogether.

When a shoe comes back to you ripped opposite the ball of the great toe where even the channel cover has not yet worn off, you will conclude that wax had nothing to do in holding the sole on. Cast your eye back to the breast of the heel, and if the seam is not ripped there, you may conclude that it was not because wax *was* used, for in neither place had anything occurred to require it to do any holding at all. Then if you desire you can go a little farther and make the old shoe worth a thousand times more to you ripped than if whole. Pick the thread out and see if there is any good wax on it, and if you do n't find any good wax, look for some poor wax, and if you do n't find any at all, then you will naturally come to the conclusion that you have fooled away a great deal of your valuable time and good money. On the other hand, if you should find anything like wax, and can

find that it is, or can be, or has been of any service, then try to determine whether that service will compensate you for all you have endured in the use of it. In this way you will soon arrive at some healthy conclusions as to what to do in the future regarding its use.

To return to Mr. Churchill. It will be noticed that he claims that wax adds strength to the thread. If it does, there must be some reason why it does. I confess that I can see none, unless it may be that in the process of waxing, the twist is rendered more even by straightening out some strands that may have been left loose and kinky, compelling each and every strand to stand its full portion of strain. In such a case I can see that waxing would do good; but the wax itself is the most brittle of all substances, except clear resin, and its strength amounts to nothing in and of itself. A string of it as large as the thread would either stretch out or break if subjected to a single ounce of weight.

I have tried to make an impartial test of the question under discussion, by first procuring a ball of fresh shoe thread (No. 10), and then wax from a custom boot maker, one who made his own wax and kept it in balls floating about in his tub, so that there could be no doubt about its being of regulation color, temper and quality; in fact, "the Simon pure article." I drew out a thread of two lengths, putting in six cords, and twisted it around a screw I had screwed into a bench for this purpose. After twisting the thread in the usual way, I waxed one-half of the thread from the screw to the end. I used a sponge on the other half, moistened with clear cold water. I then filled a coal hod partly full of pieces of iron, (see Fig. 14), after which I set a hook in the casing of a door and placed the hook near enough to the upright to cause the spout to hit (see Fig. 15), and prevent the hod from turning and untwisting the thread, when the weight was applied. I tied one end of the thread to the hook overhead, and the other to a crane hook, upon which to hang the coal hod. I then lifted the hod on to the hook, and added weight little by

little until the thread broke. I then weighed the hod and contents, and I found it to be just forty-eight pounds.

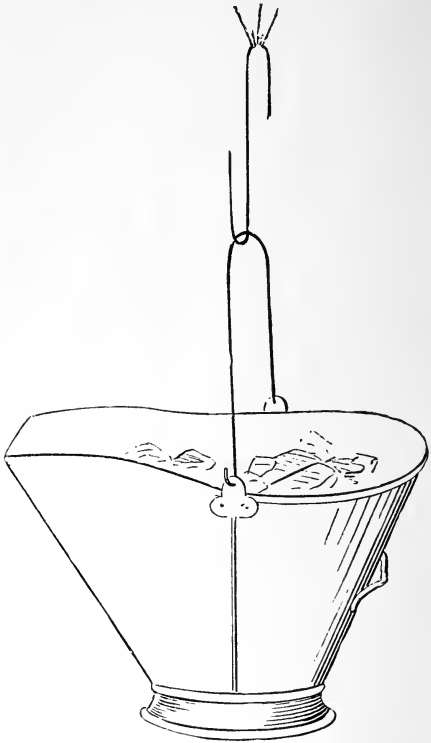


FIG. 14.

MR. LASCELL'S METHOD OF TESTING WAXED THREADS.

Upon examining the thread I found it had parted in the middle, and where it was not waxed. In looking for some

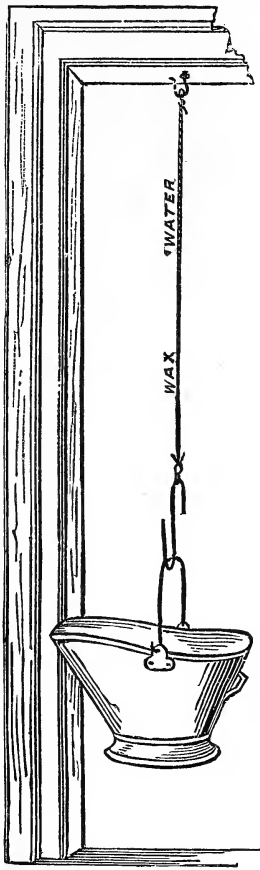


FIG. 15.

METHOD EMPLOYED TO TEST THE WAXED AND WATERED THREAD.

reason why it should break just in the centre, I found that by not taking the thread off the screw when waxing, it had chafed by slipping every time I drew the wax back and forth, which would not have been the case had the wax been applied to both branches of the thread. I then drew off a fresh thread and twisted it through a loop of soft kid, putting the screw through two ends of it as shown in Fig. 16. I then waxed

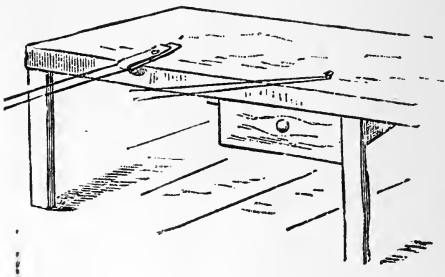


FIG. 16

SHOWS THE METHOD USED IN WAXING TEST THREADS.

a portion of the thread as before, and wet down the other half, and tying the thread in the hook applied the weight, which broke the thread after being suspended about half a minute. This time the thread parted within the knot where the *waxed* end was attached to the crane hook. In seeking some reason for its breaking there, I came to the conclusion that the knot had slipped when the weight was applied and produced friction. I tied the thread on again, using a fresh place higher up on the thread, and on applying the weight it broke about an inch and a quarter above the hook. I tried it again and again with like results, the thread breaking just about the same distance from the hook each time (see Fig. 17), where the hook and threads are shown full sizes.

A continuation of the experiments might have developed different results, *such* as breaking the thread where there was

no wax; but in such an event I cannot conceive that the *wax* could either cause the thread to break at a given strain or prevent it. The fact is, that in all McKay sewed shoes the thread never breaks nor slips out of the needle hole, large as it is; but on the contrary, the thread is chiseled off by reason

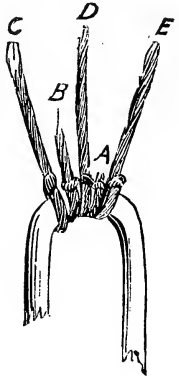


FIG. 17.

HOOK AND TEST THREADS REPRESENTED FULL SIZE.

of the movement of the sharp edges of the sole leather against it, and this movement is caused by the seam having been left slack; and the stitches have been left slack because of the *wax*, and the firmer the wax the more of slackness you will find, and the more certain the failure of the seam.

Hence, it would seem that the greatest safety in McKay sewed work lies in the use of wax *so* soft as to render nugatory any conditions which ordinary wax imposes, and when you have come to that, you have a good *lubricant*, and when you use a lubricant, it is far better to adopt a perfectly clean one, and use paraffine instead.

CHAPTER VIII.

PARAFFINE *vs.* WAX.

Our English critics seem quite persistent in the discussion of the wax question. Their prejudices appear so deep seated and strong as to defy any amount of argument, and if the facts are against them it is all the worse for the facts, in their opinion, and we might as well undertake to change the course of the comet with a fan as to alter their ideas with reference to the use of wax. Nevertheless we welcome their criticisms as memoranda of points which would otherwise be left untouched.

A nameless correspondent of the London *Boot and Shoe Trades Journal* delivers himself of the following, much of which has already been anticipated by our reply to Messrs. Churchill and Canham, yet we desire to give it the notice it deserves:

"I have read the articles and correspondenc on the 'Wax *vs.* Dry Thread' question with a great deal of interest, although I am unable to agree with the arguments advanced. In the first place, he exhibits a strong preference for cotton over flax and hemp; and, secondly, for paraffine and grease over wax. He also appears greatly in love with a large needle and a warm workshop, and does not object to have to draw up or tighten the stitches in his seam for some distance behind his needle. Much of this is, of course, opposed to all modern principles of machine-work in general and loop-stitch work in particular.

"In dealing with the question as to whether paraffine or grease is superior to wax, we have to consider whether good pitch and resin are better repellents of wet and protectors from the atmosphere than paraffine, and if such is the case all Mr. Lascell's arguments fall to the ground. To my thinking it needs but little acquaintance with the subject to an-

swer this question. Paraffine, by its volatile nature, soon leaves the thread, and this immediately becomes dry and impoverished, and far weaker than if it had never been applied. Perhaps it may not here be out of place to state the part that wax has played in the past, as this is not so generally known as it might be. If the thread was a very stout one, when half the number of strands had been cast off, a good coating was applied, and then the remainder was added, which received a complete covering; the thread was then twisted until it showed signs of recoil, when it was chafed with a piece of solid leather until the wax was sweated in; here heat was generated by friction and was necessary to perfect the process. The result was a highly waterproof cord, immensely strong and when under proper control exceedingly slippery.

"Just a word or two as to how wax strengthens a thread. If Mr. Lascell will take a thread made in the manner described above and then get another unwaxed of the same thickness, soak the latter in paraffine for a week, or indeed for a month, and then hang them to a beam and suspend weights fairly until they break, he will find how great is the difference in their strength. Scientifically I cannot correctly describe how the strength is gained, but practically I know that the adhesiveness of the wax binds the fibres so closely that instead of a band of irregular surface with thousands of points of disunion, we have a firmly combined cord possessing the natural strength of the fibre, mechanically and chemically united in the most perfect manner. To me it is incomprehensible that any one can doubt the cementing power of good wax, which when thoroughly applied to the entire surface of a thread can but have a highly beneficial effect."

In replying to the first paragraph of the above, I have to say that the preference exhibited by me for cotton over flax and hemp, is based upon the fact that the former will endure from ten to twenty-five times more friction than the latter, and as this element is the principal feature to be considered in a thread after the seam is sewed, there can certainly be no reasonable objection to such preference.

The most conclusive tests on this matter have been previously given, and all who feel sufficient interest in the subject can make like tests for themselves. As to my being in love

with a large needle, that is a misconception, as it is directly contrary not only to all my ideas of good sewing, but also to all my past endeavors to mitigate such evil tendencies which were inevitable in the McKay and kindred loop-stitch machines. Witness my patent needle, illustrated and described on pages 23, 28 and 29, the principal feature of which was to enable any given size of needle to carry *more* thread, and the other was to leave the surface of the inner sole smooth, instead of punching out those ugly protuberances all along the line of sewing as is inevitable with the round blade needle.

Where it becomes necessary to tighten stitches back of the needle, I do not of course object to its being done, and when our opponent states that "such is opposed to all loop-stitch work in particular," he only exposes his ignorance of such machine sewing, since it is utterly impossible to make successive stitches with the McKay machine upon any other principle, and that being so, it then follows that in the use of wax, especially, the larger the needle hole, the softer the wax, and the hotter the machine and the room, the more solid will be the stitching with a given amount of tension.

All users of the McKay machine have suffered damages to a far greater extent than they are aware of by reason of the wax being too stiff, or the room too cold, or the needle too small, while that other condition, viz.: the hot machine, is the only one that has been properly complied with. Now if they would have only *one* of these conditions to look after, then let them use liquefied wax and have a good lubricant. My remarks on this head have been thought by our London critics to apply to hand work as well as to machine work, and I do not object, as I deem wax an unmitigated nuisance in any work, and the more I look into the matter, the more abominable it appears. And right here I have come to the second paragraph of our London friend's communication, which is supposed to settle the wax question by one simple proposition, viz.:

"If good pitch and resin are better repellants than paraffine, then Mr. Lascell's arugments fall to the ground."

Well, now, let us turn the light on this proposition. In the first place, it is quite immaterial whether either one is a good repellant, as the better the repellant the worse it is for the thread and the boots. Whatever bad qualities may be attributed to good wax, that of its being a good repellant cannot be laid to its charge. Let us suppose wax to be perfection in that respect, indeed, absolutely impervious to moisture, and that you have stitched a pair of soles on with it. Now, the first week's, or possibly the first day's wear will have ground the wax all off from the tops of the stitches (the interior of the thread is dry, of course), and it will soak full of moisture, and your impervious coating will retain it; whereas, without the imperviousness of the coating, the sole leather, which dries very rapidly, would quickly draw all the moisture from the thread, which would always be the dryest of the two on account of the leather being such a rapid absorbent. Indeed, its absorbing qualities are so strong that it begins to absorb the wax as soon as the two are brought in contact, and but a few weeks can have elapsed ere it has become so disintegrated that you could not possibly recognize it as the coating you put upon your thread. Besides, in order to retain your good wax coating you must keep your boots in a warm climate. It won't do to walk out on the frosty pavement or frozen ground in a zero atmosphere, for then the vibration of the sole will crumble your coating, and you will lose all its "repellant" qualities. The very nature of your best wax precludes the possibility of its remaining whole, even though the sole did not act upon it as an absorbent. This is easily proven (if proof were needed) by striking a ball of wax in a room even where the mercury stands at 80° and seeing it fly in a dozen or more pieces. Such being the nature of the identical wax our London critic prizes, how can it be expected that any of it would remain as a coat-

ing on a thread subjected to the movement of the soles sewed together with it in an atmosphere more chilling than that of the room in which the boots were made, to say nothing of cold winter weather? Whatever its "repelling" quality may be as it lays on a freshly made thread, it is partly lost by friction in stitching, and the balance is soon gone when the boots are put to service. This is as it should be, in order to better preserve the thread by the rapid absorption of the wax by the sole leather. You may reply to this, that your seam is so solid that there can be no working of the outsole against the thread to disturb the wax coating, and further that there is no possibility of the thread moving in the awl-hole. If the former be true, then you will have a boot that will not squeak. Squeaking is a sure indication of a movement, and a movement is far more liable to occur in hand-work than in McKay machine work, as the outsole sets off farther from the insole, and the farther removed it is the greater the leverage on the seam, and tendency to move and chafe the thread every time the sole is bent in walking. But for the soles being moulded to the spring of the last, thus preserving that much of the curve until the boot is finished, hand-work would be less durable than McKay machine work as a rule, for much of the form of the last is lost in the latter by withdrawing the last and transferring the shoe to the horn. Much, too, depends upon the skill of the operator in handling the shoe in stitching, to prevent the stretching out at the commencement and fulling in at the close, leaving the sole puffed up and otherwise so cramped as to produce extra strain upon the seam in wearing. This, together with the fact that the natural spring of the last is lost in the stitching, causes the action of the sole on the thread to be far more severe than it otherwise would be, thus increasing the danger of rendering prematurely pervious your impervious (?) "Repellant."

Our anonymous critic says that "paraffine, by its *volatile* nature, soon leaves the thread which immediately becomes dry

and impoverished and far weaker than if it had never been applied." I can't see how paraffine could add anything by its presence or impoverish the thread by its absence. The fact is that the sooner the paraffine steps out after the stitch is laid the better. All I recommend its use for is, firstly, to so stiffen the thread that when the loop is cast off the hook, it will not drop down in the way of the returning needle, and hinder the otherwise rapid sewing, and secondly, for its lubricating quality which makes the thread run freely and prevents it being chafed by its passage through the hook and the soles. As to the "volatility" of paraffine, an allusion in the last paragraph of our critic's remarks about soaking thread in it for a week or month, shows that he does n't understand yet what paraffine is, and for his especial benefit I would respectfully refer him to some first-class grocery where he can purchase a "*wax candle*" into which he can set the edge of his thumb nail and learn that the volatility of paraffine is about the same as that of beeswax, and to melt it would require about the same degree of heat as the latter, so he will doubtless excuse us from standing over a fire for a few weeks to watch a pot of melted paraffine in order to prove the relative strength of a thread thus soaked or waxed, as neither one could by any possibility add any strength.

But he goes on to tell "the part wax has played in the past and which is not so generally known as it might be," probably because it was only done in an isolated case in a custom shop, and that only on "a very stout thread" where half the strands were drawn off and waxed, and then the other half ditto, and then the two were twisted together, etc. Now if he had divided his strands into *three* parts instead of two, and twisted each separately and then twisted all together, he would have made a "cable cord," the compound twist of which would have made a much stronger cord than if the whole of the strands had been drawn off in a single bunch and twisted in regular shoe maker style. This, however, is trenching upon the trade of the rope maker who increases

the tensile strength of a given weight of material by the amount of labor he puts into his cordage, involving as it does various styles of compound twist and with no thought of adding any additional strength by *waxing*.

It is highly probable that our London friend may find that his cocoanut will yield this kind of milk, for he says "scientifically he cannot correctly describe how the extra strength of his thread is gained." He will find by experimenting that he can get a firmer twist with water than with wax, and likewise that the *twist* and *not the wax* is what adds the extra strength. His rubbing his thread with a piece of leather and thus warming in the wax by friction, bears no comparison to the machine method of *boiling it in*, and yet you can't find any of *this* wax after the shoe has been worn three weeks.

But we will suppose that wax added twenty-five per cent. additional strength. All of this would be of no use, since the thread has ten times more tensile strength before being waxed than can be appropriated by either the maker or wearer of the shoe, as a few figures will demonstrate. Suppose your welt to be eighteen inches long and that your inseam thread will pull 60 pounds, and you put five stitches to the inch. You have then got over *two tons and a half* of holding strength to support that welt. To be exact, it is 5,400 pounds. Now of what earthly use would it be to add three-fourths of a ton more to that provided that wax would do it? Then when you stitch the sole to the welt you have a smaller thread that will pull say 45 pounds, and you put eight stitches to the inch, you will then have over *three* tons, or 6,460 pounds, to lift an outsole that weighs less than a quarter of a pound.

In view of all this anxiety about what little strength wax may possibly add to a shoe thread, it is refreshing to witness the perfect confidence of a man bending low in a pair of modern skin tight pants, with but a mere spider's web of thread, thinly coated with beeswax. What a risk this man assumes as compared with the one who has tons of

tensile strength wherewith to lift a quarter of a pound of sole leather. And with all this holding strength *the soles rip* whether stitched by hand or by machine, not, however, because of any lack of tensile strength, but because of the working of the leather against the stitches, *cutting* them off *between* the soles very rapidly (owing to the brash, woody nature of flax), leaving the stitches all in place with whatever of tensile strength it had *unappropriated*, and if your good wax had added *ten tons* to the strength of the thread the result would have been all the same.

Our critic says that when his big thread was "*under proper control*" it was "*exceedingly slippery.*" This is accounted for from the fact of its presenting a corrugated surface, more like a rope than an ordinary shoe thread. This lessened the outer friction surface by more than two-thirds, and its slipperiness would have been manifest under any kind of "control."

Let us present an illustration of two shoes which embodies all the facts herein or heretofore presented on the subjects of Cotton *vs.* Linen, and Paraffine *vs.* Wax.

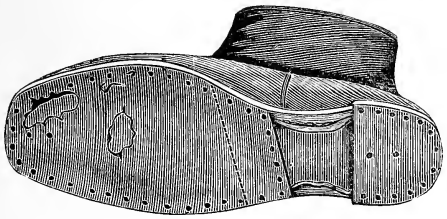


FIG. 18.

HEAVY SHOE. SOLES SEWED WITH COTTON, AND HOLDING FIRM AFTER WEARING OUT FIVE PAIRS OF HALF SOLES.

In Fig. 18, we show a heavy shoe, sewed with cotton, and made at C. A. Wentworth's factory in Lynn, for his own use.

He put on at the outset a pair of the heaviest outsoles, and, after wearing them out, has worn out *five pairs* of half soles besides. As one pair after another was put on, each in succession was lapped a little farther on to the shank until the fifth pair reached within two inches of the heel. On opening the channel, the thread looks clean and fresh, and the sewing is as solid as when first done, showing not the slightest indication of ripping or giving out in any way. This shoe is one of the pair referred to on page 20. The same was also noticed in the closing sentence of the article as copied into *The London Boot and Shoe Trades Journal* of July 1 (1882), as having been stitched with a small No. 20 fourteen-corded cotton thread, which was about the same size as Barbour's four-corded linen, and lubricated with paraffine.

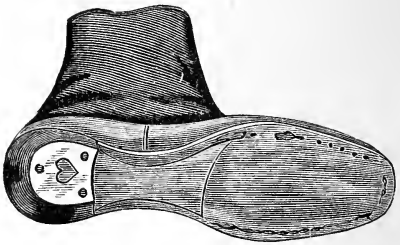


FIG. 19.

SHOWING LADIES' BUTTON BOOT (SOLES SEWED WITH COTTON) WORN THROUGH, AND THREAD ON THIN SIDE, HAVING APPEARANCE OF PEGS.

Fig. 19 is one of a pair of ladies' button boots, made at the same establishment by the foreman thereof, for his wife who weighs one hundred and eighty pounds. Mr. Balcom said that he could never make her a pair of regular McKay bottomed shoes that would not rip before the soles were half worn out, until he tried the cotton thread dressed with par-

affine. It would be difficult to find any hand-made goods to stand as well as these, with linen thread however strong, or wax however good.

When a practical shoe manufacturer (Mr. C. A. Wentworth), who had operated a McKay machine for many years for the old well-known firm of Bancroft & Purinton, and who now stitches most of his own shoes, had practically demonstrated the truth of all I have written on this subject, to the extent of supplying a large retail trade of his own, as well as supplying a Boston retail house with shoes stitched with cotton and paraffine, as he must continue to do to avoid loss by his guarantees, it ought certainly to inspire hope in the breast of every shoe manufacturer in the land that the full fruition of the anti-linen and wax-end era is rapidly dawning. And when a man like Mr. Wentworth, who does an almost exclusive retail business, and is so situated as to hear from every guaranteed shoe, can say as he does, that he saves ninety-five per cent. of the losses he was formerly subjected to by the use of linen and wax, it is a guarantee that this new era is a very important one, and that its dawning will confer a blessing upon millions of consumers as well as the manufacturers of shoes.

CHAPTER IX.

COMMON SENSE *vs.* NONSENSE.

Mr. A. S. Canham, who has once before in the London *Boot and Shoe Trades Journal* attempted to break the force of my remarks on the wax subject, again comes to the front in a recent issue of that paper, armed with ridicule, the weapon usually adopted by those whose facts fail to prove serviceable to them.

He says:

"Much as I appreciate a good needle, I beg to differ with Mr. Lascell 'that the strength of the thread in a shoe depends entirely on the quality of needles used.' If Mr. Lascell had not been a modest man he would have told us this before, but being bashful this statement and his exit are contemporaneous."

In reply to this, I have to say that this matter formed the basis of the first one of this series of articles, and as it is a subject of so much importance to all users of sewing machines, it will bear repeating often, indeed it should be written in letters of gold and pasted in the hat of every manufacturer of shoes, gloves and clothing in the land. The reader is referred to the first page of the body of this work.

Now the facts above referred to show in the most unmistakable manner that it is impossible to have the same strength of thread *in the shoe* that the same thread had on the spool, and if there is any one thing that all sewing machine users should be especially thankful for, it is that Mr. Canham's remarks have again called the reader's attention to them.

Manufacturers are very particular about the quality of the stock they buy, and if a thread pulls ten pounds, they naturally conclude that they have all of that original strength in the seam, but investigation will show that, all other things being equal, the percentage of strength remaining in the shoe depends on the quality of the needle used. Stitchers know these facts by daily experiences, for they are often heard to complain, "*My machine roughs the thread.*" They do not appear to realize that it is the fault of the needle, which has so nearly ruined the thread that it will not bear the tension in drawing in the stitch, and that the frequent breaking of the thread results therefrom. It seems very remarkable that after so many years' use of sewing machines, a fact so notable and startling should have escaped notice.

"Horse sense" has become a common expression, but it would seem that manufacturers do not possess very much of it, notwithstanding the opportunities they enjoy for learning from daily and I might say hourly experience; hence it is not to be wondered at that Mr. Canham should pick out that idea of the needle not having anything to do with the quality of thread *in the shoe* as a subject of ridicule, nor that he should say that:

"No more damaging remark against the use of the McKay machine could be framed than the one Mr. Lascell gives, if his premises are true. What can be thought of the suggestion he makes of leaving stitches unpulled in and then trying to tighten up afterwards?"

Now, this is exactly what the McKay and all kindred machines do, because that method is inherent in the machine, and you might as well expect the potato to eat the Irishman as to see a stitch drawn in in any other way than by the power exerted on the next. All users of the McKay machine know this, and it is passing strange they cannot see that to make solid work with wax they must have it soft, and the softer the better; and have the machine and room hot, and the hotter the better; and the needle large, and the larger the

better, until you exceed the limit which the leather will permit. Now, as all this is contrary to the common sense method of stitching, it has been my endeavor to lift that machine out of its rut, to place it as a stitcher on a level with the best of hand workmen, and to produce with it a more flexible and durable shoe bottom than the hand-made. So I reverse all this by using a soft compressible cotton thread in a small V-shaped needle-hole, and lubricant that shall cause the thread to pull in quite easily, even though the strength be exerted on the succeeding stitch. It is only because the public have so long been "hood-winked" by tradition and ignorance that they still adhere so tenaciously to such a dauby and useless substance as wax, when it is as impossible to trace its usefulness in a shoe as it is to find teeth in the jaws of a hen.

When a boot rips in the shank or fore part, the stitches are always found in place, whether waxed or not, and the stitches have to be picked out of both welt and sole, and wherever a rip has occurred it has always been where wax could never have been of the slightest use in preventing it. I challenge all the shoemakers in the world to prove the contrary, and the only kind of proof needed is old boots. Old theories and traditions are valueless as compared with *old shoes*, and both can be had in any quantity. The former are "hoodwinking" and speculative, but the latter are reliable and trustworthy.

I would not by these remarks deter any one from expressing his views, however freely, by ridicule or otherwise, as I wish to have my opponents put themselves squarely on a record which, in the near future, will become interesting reading.

Mr. Canham will doubtless admit that all the ripping of shoe bottoms that has ever occurred has been of waxed thread-work, and a little investigation will show him that of McKay machine work in particular, at least three pairs have ripped for one that has held till the soles were worn out.

And now, although limited as to space, I will quote Mr. Canham's "Universal Panacea" for all these difficulties, to wit:

"A balance of power both in tensile strength of thread and resistance of material must be sought for; the tension of the machine when properly equalized should be just below the breaking strength of the thread, and length of stitch just sufficient to bear the strain without breaking through."

What a wonderful exhibition of penetrative power is here displayed, in stating just what has been instinctively practiced from the most ancient barbarian days to the present time! But when he adds that "*then* the smaller the needle the larger the thread, and the more wax the better the shoe," he is as wide of the mark as he could possibly get. It is the exact language to use in describing how *not* to make solid work, especially with the McKay machine, and if that is their plan of stitching with the McKay machine it is not to be wondered at that it is so little used in Europe as compared with America.

It is not a little singular that on the very day I received the *Boot and Shoe Trades Journal*, containing Mr. Canham's ridicule of the cotton and paraffine question, we received a telegram from Ohio ordering prepared cotton for sole sewing; also an order from Maine and from New York, and on the same day a Lynn retail shoe house caused one of their new trade circulars to be pushed under our door, announcing as a leading feature of their make of boots and shoes that "all were sewed with elastic unwaxed thread." This reminded me forcibly that in 1840, when the subject of crossing the Atlantic by steam was uppermost in men's minds, an English lecturer was showing the absurdity of the idea to an applauding audience, when the newsboys were crying "Extras," announcing the arrival at Liverpool of the American steamship "Great Western." So now as then hard facts prove to be too formidable for theories to butt against, and emphasizes the saying that "Truth is mighty and must prevail."

CHAPTER X.

CANHAM *vs.* LASCELL.

In a recent issue of the London *Boot and Shoe Trades Journal*, Mr. Canham replied to an article of mine which appeared in the July number of the *Shoe and Leather Manufacturer*, and in the course of his letter complained that I did not quote him fully. (See Chapter III.) To avoid any further complaint on this score, I now give his last letter to that journal in full:

"With your permission I will make another remark or two on this subject. In Mr. Lascell's last letter, he starts by laying down the law that the strength of a seam principally depends on the thread's power to resist friction after it is sewn. I think he will not object to this rendering of his idea, and as it has more the appearance of reason than any other of his propositions, I will look at it first.

"To begin with, I deny his assertion that cotton thread will bear from ten to twenty-five per cent. more friction than flax, that is, if the flax thread is properly made; and it is no hard matter to obtain good flax thread in England, whatever it may be in America. The friction idea of a seam is a sad humiliation to the makers of sewing machines. A logical illustration: What would be thought of a boiler smith allowing for friction in his joints, or the shipwright in his seams, or the coach builder in his work? The idea, aim and end of all joining together of substances is to attain as nearly as possible the nature of a good, welded joint, produced by a smith, or clever piece of glued work by a joiner. If there is to be elasticity it must not be gained at the expense of the rigidity necessary for thorough endurance, and I make bold to affirm that in fair hand work, friction as a cause of failure was a thing almost unknown. I am well aware that even in hand work, especially in the wholesale trade, large awls, light threads and as little soft wax as possible produced the

same results as the large hole, hot room and soft wax which Mr. Lascell in his early papers seemed so much to prefer to tight sewing. But he now repudiates this system. All his sympathies seem to go out to the sufferings of the users of the McKay machine. Well may he exclaim in such company: 'I deem wax an unmitigated nuisance in any work.'

"In a former communication, I stated that good wax protected any thread, inasmuch as it preserved it from the rotting influences of air and moisture. It does not require a very practical or acute mind to understand the significance of this proposition, but Mr. Lascell demolishes it to his own satisfaction most contemptuously by stating that the better repellant wax may be, the worse it is for the thread, inasmuch as when the head or surface is worn off the stitch the wet can get into it and cannot get out. May I ask him if he ever took the sole off an old hand-sewn boot, say of moderate substance, sewn with a ten-cord of flax thread, ten stitches to the inch, with a fine French or square awl, in which proper wax has been used? and if he has, what was his experience of the thread? For my own part I have had thousands through my hands and under my supervision, and no part of a repairer's work was more laborious than getting the old sole off, notwithstanding the expedients used. If practicable, the edge of the sole was cut down slanting to the welt so that a great portion of the stitching thread was taken away, and then a good strong awl for leverage was necessary before sole and welt would separate. Thoroughly waxed thread, even after one or two or even seven years' wear, cuts like iron, and would speedily destroy the edge of a knife. Did Mr. Lascell ever try to pick the stitches out of an old welt of this kind, previous to re-sewing the new sole on? If he did, the difficulty of the task, no doubt, gave him his disgust of *good wax*, I know all dressed leather has a tendency to decompose wax of any kind, but it could not take it out of a well-made thread. Years ago, when the Wellington boot was in general wear, we often had them to graft, and in taking the old boot to pieces we had good opportunity of testing the value of wax; frequently the seat was torn in trying to draw out the stitches, and even in the closing seam, the stitches often had to be picked out singly with an awl. Mr. Lascell's argument all goes on the assumption that it is impossible to sew a seam that will not allow vibration, or to fill a hole so that water cannot get at the thread. In direct contradiction to his statements I assert that the strength of a seam depends on the lateral strength

of the thread, as in proportion to the strain it will bear — which is consequent on passing through a small hole, and allowing the materials to be drawn firmly together — will be the endurance of the work. Of course, flax has a coarser fibre than cotton, and its strength is double the proportion of its relative difference; the vegetable, fluffy floss of cotton gives it a pre-eminence for the purposes of the seamstress, but constitutes its unfitness for the rougher processes of boot making.

"As regards the twist in a shoemaker's thread, Mr. Lascell is not infallible. A very sharp twisted cable-laid thread breaks easier under some conditions than a looser cord. If he wishes to test this, let him take a sharp made whip-cord and an ordinary twine, well made, of the same weight, and having given them a hitch, let him subject them to a sharp jerk, and he will find his sharp cable-laid thread the weaker of the two. Up to a certain point twisting is a source of strength; after this is reached the cross-lying fibres saw each other. Few had better opportunities for testing this than old hand bootmakers; they knew to a twist when their thread was perfect; whilst a loose thread was weak and slovenly, one too sharply twisted would invariably kink and break. As to incorporating wet with the thread, Mr. Lascell appears quite unaware that wax may be thoroughly driven through the thread, and so it may be done now mechanically when a proper machine is found for its use; the strands can be separately waxed, twisted and chafed, and made so thoroughly compact that neither air nor water will affect them for a long time. Then as to his knowledge of wax. Can he find a bootmaker that would use the brittle wax he talks about? Good wax is tough and pliant, and yet as adhesive as glue.

"What an imposing array of figures he uses to show that even his weak cotton thread possesses twenty times more strength than is required to hold a sole on, if it were not for the sole working or sawing it through. Yet with so plain a solution before him he never dreams of staying the friction by making a tight seam that will not yield. As to his seeking illustration for his friction in the squeaking of hand-sewed boots, it was not the surfaces of welt and sole that produced the sound, but the dry bottom filling which layer after layer worked with the action of the foot. A layer of bladder between these would have prevented the sound without extending the seam. I repeat that it is to the solidity of a seam that we must look for strength and it is to the lateral

strength of the thread that we must trust for a firmness that will not allow the edges of the sole or welt to saw. As soon as this action sets in there are hundreds of points of leverage, and no thread could long survive the action. It is the expedient of incompetence to offer such a solution to so important a question. There are machines in the market that can make and use such a thread as renders such attempts ridiculous.

"In conclusion, I must beg Mr. Lascell, should he do me the honor of dissecting me before an American audience, to quote my entire letter, and not a mangled and mutilated version of it. I have tried not to put a strained meaning on his letter as truth, and neither egotism nor prejudice has been my prompter."

Answering the first paragraph of the above, I have to thank Mr. Canham for a correct rendering of my views in this, that the true test of any thread is its ability to withstand friction after it is sewn. The usual pulling test is all well enough as determining the quality of any two or more brands of cotton, silk, or linen thread, but *when in the seam*, whatever strength the thread possesses is multiplied by the number of stitches in the same. For example, take the front seam of a side-laced boot, which will average ten inches in length. Putting eighteen stitches to an inch you have one hundred and eighty stitches, each capable of withstanding a strain of seven pounds, or one thousand two hundred and sixty pounds to hold the two halves of the front seam. Then in the back seam there is, we will say, eight hundred and eighty-two pounds, which gives an aggregate of two thousand one hundred and forty-two pounds holding strength, to hold the two halves of the upper together. Now the question arises, how much of this holding strength is appropriated by the wearer of the shoe? What woman can stand a forty-two pound squeeze of the foot, leaving the other *twenty-one hundred pounds* out of the question altogether? A woman who weighs one hundred and fifty pounds, by bearing her whole weight on one foot could not produce a strain on the seam of more than a mere fraction of her weight.

The principal pressure would be downward, the balance being caused by the spreading of the foot. If the boots were a loose fit, the upper would not receive a lateral strain of more than five or ten pounds, as much as tender feet could endure, and this would only strain the thread an ounce or two to the stitch. It will, therefore, be seen that there is a superabundance of tensile strength to withstand a very slight strain, and consequently if a seam fails it must be because the stitches are severed by *friction*. Now millions of tests have proved that the thread which best withstands this friction is cotton.

As to "the friction idea of a seam being a sad humiliation to makers of sewing machines," I must say it is difficult to see where the humiliation comes in, since all sewing machines are capable of giving any amount of tension; consequently his "logic" must be regarded as exceedingly thin, and the "humiliation," if any, belongs to Mr. Canham for giving expression to such an idea.

In his endeavor to answer what he terms this "*friction* idea" he simply denies the *fact* and then takes refuge in boiler shops, etc. He asks "what would be thought of a boiler-smith allowing for friction in his joints?" not realizing that the Almighty had provided for that in advance of the creation of Adam. When the boiler question comes up we will attend to it.

If shoes are to be like welded up work they might as well be wooden *dug outs*, or cast in metal. If, he says, there is to be elasticity to a shoe it must not be gained at the expense of the rigidity necessary for thorough endurance. Well, now, it happens that the most endurable shoe bottom is the most *flexible* one. I refer to the turn or pump sole, and the nearest approach to that for durability is the most flexible shoe that can be made of any other kind. The way to make solid, flexible work is to leave the wax out, and use a lubricant that will enable you to draw a larger amount of thread into a given size of hole than you can possibly do with wax.

If you use a cotton thread there will be no need of wax to preserve it from decay, as it is not so susceptible to atmospheric action as to require any care on that account.

Mr. Canham says, "I make bold to affirm that in fair hand work, friction, as a cause of failure, was a thing almost unknown." Well, he could have said the same as to pegged work. I used to make light single-soled calf boots, with a single row of pegs around the forepart and two rows in the shank, and had no thought of their ripping. In fact, I have ever found pegging more trustworthy than sewing. Thirty years ago I made twenty-five pairs of pegged boots and shoes to one pair of sewed, and nearly the same proportion would be made now but for the advent of the McKay Sole Sewing Machine. This machine's work has ever been more rigid and less durable than pegging (owing to the use of wax), yet it possessed the *name* of being sewed work, and is vastly cheaper than any done by hand. Hence its rapid introduction in spite of the fact that it possesses none of the merits which the term "sewed work" implies.

While I have tried to make my position thoroughly understood, regarding the soft wax, hot room and large hole, as being a necessity which the *machine* alone imposes, yet it will not be unprofitable to repeat it again. And first I would ask Mr. Canham why the heating of the horn was provided for by the inventor? and why manufacturers keep up the expensive heating process if not to soften the wax? Will he also explain how it is possible to use a McKay needle that will not make a hole at least six times larger than the thread? Yet, this is quite too small. How the shoe manufacturer's heart would swell with gratitude toward Mr. Canham if he would only tell them how to keep the wax as hot on the loop that is left standing above the shoe as it is in the horn below, with that cruel shoe upper completely enveloping it as if to prevent the possibility of any heat escaping. This can be compensated for to a limited degree, by inclosing the machine in a small heated room and soften the wax. Now, why

is all this *trouble and expense* necessary? Simply because you will persist in using wax, and that, too, right in face of the fact that it is impossible to find a single particle of it on the thread when the time has come at which its aid would be of any use.

Mr. Canham should understand that the two systems of hand and machine stitching are entirely different. What is essential in the former is equally essential in the latter, but is impossible of attainment. This will be made clearer by the accompanying cut, which represents a section of the channel of a shoe sole being sewed. The needle has risen to its highest point to pull in the stitch next behind it; the feeding has

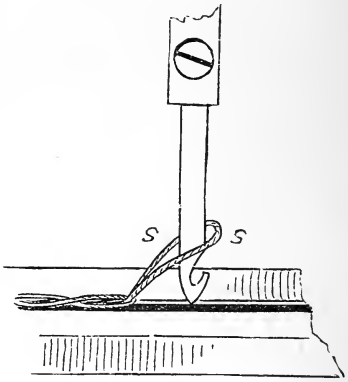


FIG. 20.

THE NEEDLE IMMEDIATELY AFTER IT HAS CAST OFF A LOOP AND IS RETURNING TO TAKE UP ANOTHER.

taken place and the loop *S S* is cast off and left standing while the needle returns to hook up another loop. Now, there is more than enough thread in that loop to form the next stitch, so all of its cooled surface has to be drawn around

the needle, as well as around the leather between the needle holes. This is done by the power exerted on the loop next to be pulled up, hence it follows that the less the friction the tighter will the outer and inner sole be drawn together with a given amount of tension. Then the more firmly they are drawn together the more durable the shoe will be; now the only way of lessening the friction is to use soft or liquefied wax, a hot machine and room, and a large needle hole. But it is far better to employ a paraffine lubricant on a large thread drawn into a small hole, thus making a more durable and flexible seam with a cold machine operated in any cold corner of the room. This method also does away with the expense of heating and the smut, as well as the annoyance of handling a hot machine. I have no fears that any reader of my articles can find the slightest confirmation in Mr. Canham's statement that I have repudiated the idea of soft wax, large needle and hot room in stitching with the McKay machine.

As to "wax protecting the thread," all any person has to do to prove the contrary is to borrow a waxed end from some cobbler and compare its strength with a freshly made thread of the same size. As to the labor of taking the worn out sole off a "fair stitched boot, sewed with a ten-cord thread ten stitches to the inch," I should much prefer that job to the taking off a sole of like thickness into which as many pegs of the same size had been driven, or that of pulling off a sole stitched with the same bulk of cotton lubricated and drawn into a hole as small as it could be pulled through. Either when old would be so full of grit as to "cut much like iron," and destroy the edge of a knife. To another of Mr. Canham's queries, I have to say that I never have spent much time in pulling the old stitches out of a welt. The only reason I ever found for doing it, was in their tendency to come out, as the new stitches went in, or on withdrawing the awl. My great anxiety was that the old stitches would stay where they were, but they seldom did, and I had more

or less scraping and pasting to do to cover the rags. Again, Mr. Canham says, "up to a certain point, twisting is a source of strength." Well, then, that is the point to stop at of course.

Again, he says, "Mr. Lascell is unaware that wax may be thoroughly driven through the thread mechanically when the proper machine is found for its use." Well, Mr. Blake brought that out with the stitching machine; and it has been in use for many years and the machine threads are purposely left slack twisted in order that the wax may thoroughly permeate every strand. There is no hand system of waxing that bears any comparison with the Blake method of *boiling it in*, and yet the thread thus waxed fails constantly in spite of this waxing, on account of the inability of linen to withstand friction. Again, he asks, "Can he find a bootmaker that uses the brittle wax he talks about?" Yes, they *all* use it. It is the identical wax Mr. Canham admires. He may make a batch of it, and if he can't make it fly by striking it a sudden blow with a hammer even in a warm room, then I will confess that I do n't know the nature of his good wax. But, he adds, that "good wax is tough and pliant and as adhesive as *glue*"!

If this is so, then he is the only man living that can make it. Again, he says that with his great array of figures before him he never dreams of staying the friction by making a tight seam. Well, that is where Mr. Canham fails again to understand what he reads, since I have advocated the use of a lubricated thread *for the sole purpose* of drawing the soles together *more firmly* than it was possible to do with wax. It is the use of wax in sewing with the McKay machine that makes all the difference there is in value between its work and hand sewing.

As to "dry bottom filling piece over piece" being the sole cause of boots squeaking, that admits of much doubt, but it can't be questioned that if "a layer of bladder between the pieces" will overcome that great annoyance the demand for bladders should be far in excess of the supply.

Again, Mr. Canham says that "it is to the solidity of the seam that we must look for strength." That is all right; only I should substitute the word *durability*, for there is always far more of tensile strength than can be of any use, and all of this in excess is a useless waste. Abandon wax and you can reduce the bulk of thread one-half, and have a more durable and flexible shoe. He also says, that the soles must be drawn together so tightly that there can be no sawing of one surface against the other. Well, that is all correct; but you can't produce that result on the McKay machine with the use of "good firm wax," nor with anything of the nature of wax, without the other conditions of hot room, hot machine, and large hole for the thread to pass through.

Again Mr. Canham says, "As soon as this sawing action sets in, there are hundreds of points of leverage, and there is no thread that could long survive the action." I do n't know about the "hundreds," but in McKay stitching there are about four of these "points" to the inch, and by the use of wax the "action" sets in about six months earlier than it otherwise would. Hence the loss which all McKay machine users sustain in the employment of wax, a nasty and useless incumbrance, and flax, the poorest of all known substances for withstanding friction, atmospheric action or moisture.

I will notice one other point. Mr. Canham says, "The vegetable, fluffy floss of cotton gives it a pre-eminence for the seamstress, but constitutes its unfitness for boot making." Well, now, in looking at the thread manufactured by the best known makers of England and America, one fails to see anything about it of a fluffy nature. For seven years past, cotton thread has been used for seaming every known grade of shoes, both men's and women's. In Lynn it is preferred to both silk and linen on account of its greater durability for *shoe seams*, and, consequently, it is too late to talk of its unfitness for shoes or for anything else. Cotton thread for shoe work, six-cord, spooled on 500-yd. spools,

from No. 12 to 50, is now made by all thread manufacturers. It is now used on the Willcox & Gibbs' automatic loop-stitch machine which, seven years ago, was considered the most unfit machine for anything in the line of leather stitching, but is now considered to be the only safe machine to use in seaming shoes.

When first I commenced to talk of such a combination of thread and machine for shoe seams, my sanity began to be questioned; but now it is undoubted, notwithstanding my ideas regarding cotton and paraffine for sole sewing.

CHAPTER XI.

COTTON *vs.* LINEN THREADS.

To the Editor of the Boot and Shoe Trades Journal, of London, England:

Dear Sir, — I seem called upon to reply to Mr. A. C. Canham's communication in your issue of January 20 (1883). In the first place, I would say that I have used the names of McKay and Blake interchangeably, as I was under the impression that the McKay machine was best known in England as the "Blake," the name of its inventor.

It is true that at first, I set out to show how best to utilize the loop-stitch machine, but I have found it needful to step aside at times in order to meet my opponents upon their chosen field, as in the present instance where Mr. Canham prefers to discuss the idea of "establishing the most perfect system of sole sewing possible," which, to my view, however, embraces the sewing by loop-stitch machine. This necessarily carries us back to first principles, where, instead of arguing the merits of any given method, we have first to consider the material used in sewing; in other words, the two greatest impediments to making good work, viz.: *Flax* and *Wax*.

There is not a shoemaker in all England who is not aware that his linen thread deteriorates so rapidly that if he was to leave a ball of it exposed to the atmosphere for a month or two, it would be unfit for use, to say nothing of the additional damage that would accrue by immersing it in his shop tub every day or two; and it would be a matter of surprise to find fifty per cent. of its original strength at the end of

that time. Now the fact that an inseam so often gives out where the original holding strength equalled one hundred and fifty pounds to the *inch* of seam, and that of the welt also with two hundred pounds to the inch, is explainable upon no other hypothesis than that of the rapid deterioration of the thread in the first instance, and, secondly, its inability to withstand friction, even at its best, and much less to withstand it when two-thirds rotted. In the first place, flax has to be rotted to a considerable degree before it will separate from the stalk at all, and from that point onwards its deterioration is as much more rapid than cotton as a hemlock board lying in the mud is than that of the wood in one's desk, and it is only because there is such a superabundance of tensile strength of thread in the new shoe, that an ounce to the stitch of it is left when the shoe is worn out, and the further consideration that the interior of the thread is protected to some extent by the twist, and its enclosure by the surrounding leather, into which it has been tightly drawn. Now, in this matter, we find the solution of Mr. Canham's queries as to "plow shoes." In the uppers of such, the thread is more exposed to air and moisture, and as the shepherds wade through "the dewy grass," the leather becomes soaked, and afterwards dry and hard, so that where the wrinkles are, the seam is bent backwards and forwards like a door hinge, and the strain and consequent friction soon wears the thread in two, and this forces us right into a pit that Mr. Canham thinks does not exist, for he says: "If once we admit the principle of one edge sawing upon the other as a necessary evil, we are in an unfathomable sea of difficulties." But here we are, notwithstanding, right where the great mischief arises, and it is only while the linen is at its best that the seam remains unbroken, and however well the stitches were drawn in, friction and decay *will tell*, and no amount of "skiving of the pieces" will avail to prevent their being speedily severed, notwithstanding Mr. Canham's questionable proposition that, "In proportion as the thread

will stand the strain of the machine in tightening in the stitch, will be its power to keep the work from sawing asunder."

Let us look at this for a moment. Suppose that an upper is secured with a linen thread that will pull twenty pounds, the thread will then be got in safely by a tension of nineteen and three-quarter pounds, and there will be only *one quarter of a pound* left to withstand a strain in wearing, and, according to the best calculation I can make as to the rapidity of the thread's decay, that shoe would last from twenty-four to forty-eight hours. But fortunately no upper leather would withstand such a tension without cutting through, and hence Mr. Canham's proposition would be defeated, the shoemaker's credit saved, and the consumer remain in blissful ignorance that Mr. Canham had said anything detrimental to his interests; but with a cotton thread, even that quarter of a pound of surplus strength would remain without sensible deterioration, until the shoes were worn out, and would be quite sufficient to answer all the requirements as to holding strength.

As to sole sewing, it must be a matter of no little astonishment that a McKay sewed bottom, having only one line of stitches, (and they nearly one-third of an inch in length), should come so near equalling hand-made welts for durability, the latter having twice as many stitches in the inseam, and three to six times as many more in the welt. In this will be found ample confirmation of the correctness of my theory regarding the great superabundance of tensile strength in proportion to any conceivable requirements in the case. Then add to this the fact that the McKay needle punches a hole six times larger than the thread that is drawn into it, while the hand awl is smaller than the thread (what an enormous difference in the impinging qualities of the thread-holes of the two systems), and yet the McKay thread never pulls out of those large holes, but is invariably found in place, both in the outsole and insole with the thread chiseled

off between them, with no wax to hold the thread in place. In view of all this, it must be apparent that all this talk about the superior strength of linen and the adhesiveness of wax is making a great ado about nothing, for there is not a single redeeming quality about either; on the contrary, both are damaging to the last degree, as compared with cotton and paraffine, either in machine or hand work. That cotton will endure from ten to twenty times as much chafing as linen will, is clearly demonstrable; it then follows that it is as much more durable, and add to this the fact that linen will deteriorate by atmospheric action ninety-five per cent. faster than cotton, we have another large item to put to the credit of the latter which any comparative test will confirm the truth of.

As to the test Mr. Canham suggests, of sewing two seams, one with wax and one without, and then cutting off the tops of the stitches, and pulling the pieces apart, I should say that, all other things being equal, the wax sewing would be the most difficult to pull apart; but that would be simply finding out what everybody knows, viz.: that fresh wax will stick, and it would not take ten minutes to prove that if its adhesive power could be properly utilized, it would afford far more than sufficient holding strength without any thread at all. The impinging of a dry thread in a hole that is no larger than the thread, is far more than is required to keep it in place, and the fact that it is always found in place in a ripped shoe bottom is proof of it, if any is needed, for there is no wax, and if there was there could be no earthly use for it, as the thread would be there all the same if dry. The ripping is always *between* the pieces and *not* by the slipping of the thread from the holes. Waxed thread work has always been ripping in this way, and the word "*Warranted*," so often stamped upon shoes is a public confession that ripping is the *rule* rather than the exception. I do not hesitate to say that if a "World's Convention" of shoemakers was called to devise *the worst possible method* of sewing a shoe, and they were

to consider first, how to make the most rigid and uncomfortable bottom, and secondly, how to prevent making a close seam, and ensure a crack in the finished edge, and, thirdly, what thread to use in order to ensure the failure of the shoes in the shortest possible time, they could not possibly hit upon a better combination than that in general use, and which Mr. Canham so earnestly commends, viz.: Wax and Flax.

I have just made a partial test of the impinging power of a dry thread in a piece of dry sole leather by drawing a dry cotton thread into as small a hole as possible, but having no bristles at hand, I took a sixteen-cord No. 20 cotton thread, and after making as good a taper as possible by scraping one end with a knife brought the many strands together as compactly as possible, and threaded the end through the hole, which proved to be large enough to have drawn in another sixteen-cord thread in the regular way of stitching with the ends properly bristled, but, on applying the thread tester, I found that it registered just three and three-quarters pounds when the thread began to move. I was about to make a thread in the regular way when it occurred to me as being of no consequence, since by whatever exertion the thread was pulled in, it would require at least an equal force to start it back.

Let us suppose a man pulls only ten pounds with each hand, which would be less than one-quarter of the thread's strength (and, according to Mr. Canham's requirements, would be exceedingly slack work), we should then have twenty pounds impinging power to each hole, and eight holes to the inch would give one hundred and sixty pounds to the inch, and, eighteen inches round the shoe would give *two thousand eight hundred and eighty pounds* to keep the sole to the welt *after the tops of the stitches had all been cut off*. Now, if we give wax all the credit Mr. Canham claims for it, of what use could it possibly be to add a ton or two more to hold the sole to the welt?

Now suppose the thread had been waxed and the tops of

the stitches allowed to *wear* off; by that time the wax is absorbed and the space it occupied would give that much of slackness to the thread, be it much or little, which, however, would be of no consequence as there would be an abundance left. Most shoemakers after hauling in the stitch, give it a final pull of about forty pounds, or nearly the strength of the thread, to make it *solid*, and it takes nearly all the strength of the thread to start it, and it moves hard, while with a dry or lubricated thread every ounce tells, and when the stitch is drawn home it takes but little impinging force to hold what is gained, and more especially if the next stitch back is moved, and thus a solidity of seam is got that will not admit of any movement of the sole upon the welt nor of such a shrinkage as to cause a crack in the finished edge after the sole has seasoned.

Mr. Canham says that "no machine boots were ever made or will be, so elastic as best hand made goods." Well, notwithstanding this assertion, the fact remains that Mr. C. A. Wentworth, of Lynn, has been turning out shoes sewed on the McKay machine with cotton and paraffine, for over a year, which in point of flexibility and mellow feeling are so far superior to hand-made welts as to be preferred even at the price of the latter, and I now propose to send a pair to the editor of this journal that shall fully corroborate, not only the above, but every other statement I have herein or heretofore made on the cotton and anti-wax subject.

Acting upon the above suggestion, I went to Mr. Wentworth's and had a pair of light kid uppers fitted (size 4), and had the bottoms stitched on the McKay machine with sixteen-cord No. 20 cotton, waxed with paraffine; the size of the thread was a trifle above that of a five-cord Barbour's linen; both the outsole and insole were of medium weight and of firm sole leather. When the pair was finished, I compared them with several of the best hand made turn shoes made in Lynn, and in every case these shoe bottoms proved to be more flexible than either pair of the turns with which they

were compared. I then expressed them to the editor of the *Boot and Shoe Trades Journal*, 282 Strand, London, England, not only as a refutation of Mr. Canham's assertion, but as proving the truth of all the foregoing statements regarding the durability of cotton, and the uselessness of wax. I requested the editor to exhibit them, and then, if possible, find some one that could wear them, and have them put to steady service until worn out. The uppers were closed with No. 36 cotton on the automatic tension Willcox & Gibbs' machine, and no staying was put on either outside or inside to strengthen the seams. In due time the *Boot and Shoe Trades Journal* (of April 7, 1883) published the following acknowledgment:

"By way of test, and for the inspection of those of our readers who feel an interest in the matter, Mr. Lascell sends us a sample pair of ladies' light boots, made in Lynn, under his directions, the uppers seamed with cotton, and the soles sewed with a cotton thread, sixteen-cord No. 20. In a letter which accompanies the sample boots, our attention is drawn to the qualification they have of being as flexible as turned shoes; this quality they certainly possess in a high degree. The boots are not socked, and the stitching inside is consequently visible; this is so clean and perfect as to make no sock necessary. The boots may be examined at this office on personal application."

I will here state in regard to this pair of shoes that the insoles were not slashed, nor was the grain shaved off, nor were they cut from card clothing, nor were *any* of the modern expedients resorted to in order to gain flexibility; but, as before stated, they were *whole sole leather of medium weight*, and the stock fitting was done in the usual way for McKay stitching, and the uppers were lasted in the usual manner, *with tacks*.

In the *Boot and Shoe Trades Journal* (of December 29, 1883), a few days over eight months after the acknowledgment of the receipt of the boots, as above quoted, I find the following:

"We take this opportunity of mentioning the excellent results which have been obtained from a test pair of boots, sewed with the unwaxed cotton thread which Mr. Lascell so strongly advocated in our columns some months ago. *The boots, a pair manufactured under his directions, have completely borne out his assertions as to the durability of cotton and the non-necessity of wax.* We propose devoting an article to this subject in an early number."

I am not aware that the promised article has as yet appeared. If it has I have overlooked it, which is much to be regretted as I have now (May 26, 1884) no time to get it by correspondence, as this book is now in press, and the entire edition will be printed ere an answer could be received.

While it would be interesting to have a detailed account of the service to which the shoes were put, yet it would seem that nothing need be added to the editor's sweeping declaration that the test shoes "had completely borne out my assertions as to the durability of cotton and the non-necessity of wax."

This covers the entire ground, as the editor had not only read, but published, all of the matter contained in the foregoing chapters as well as those that follow. And now if it is possible for me to produce a pair of McKay sewed shoes "more flexible and durable than hand made," (which I have demonstrated many times during the past eight years, that it is possible to do), then it follows that any number of pairs may be made in like manner, and this being true, I have as truly ushered in a new era in the manufacture of shoes and gloves, the importance of which can hardly be estimated.

CHAPTER XII.

COTTON *vs.* SILK AND LINEN THREAD.

EDITOR SHOE AND LEATHER MANUFACTURER, N. Y.:

Your New England correspondent writing under the *nom de plume* of "Fine Shoes" in the February number demands a reply. The first paragraph of his communication I will quote:

"I think this acknowledgment of the general use of cotton explains the reason for the breakage of seams in so many of the Lynn made shoes. (I want it understood, by the way, that I have nothing against any of the Lynn manufacturers, but I think it would be well for them to know the truth on this question.) I have seen shoes made by well-known manufacturers of ladies' work of Lynn and elsewhere that broke in the front seam after one or two weeks' wear, and it is a general complaint in this part of the country that the seams of ladies' shoes do not wear well. I have examined a great many of these seams, and found them invariably done with cotton."

Answering the first three lines, I will say, *not necessarily.* The ripping of shoe uppers dates too far back. The great trouble with machine-stitched uppers has ever been their tendency to rip, and up to 1875 the idea of seaming shoes with cotton had never been thought of. The thread in use, especially the upper or needle thread, was either silk or linen, and it was found necessary to add stays outside or inside, or both, to support the seams, and that cumbersome, senseless and expensive practice has been continued to this day.

Many of the wisest heads in the business are free to admit

the uselessness of the stays, but they are obliged to continue to apply them merely as a *selling point.* I intend, however, to discuss this staying matter in a future article, and will, therefore, pass it now. I merely allude to it here as one of the proofs that, notwithstanding the twenty-five years' use of the best of all shuttle sewing machines (the Howe), and the best of silk, shoe manufacturers have been subjected to constant and grievous losses by the failure of seams stitched under the very conditions "F. S." is so wedded to. The ripping of seams was by no means confined to goods made in Lynn or New England, but has been the bane of *all* throughout the entire country, as must be freely admitted by all, not excepting "F. S." whose very unsophisticated address to Lynn manufacturers must be quite amusing to such firms as Keene Brothers, Morgan & Dore, B. F. Spinney & Co., B. F. Doak & Co., and others, either of whom turn out twice as many pairs of shoes in a day as "F. S." claims to make in a year, and all seamed with cotton on the Willcox & Gibbs machine. It is, indeed, due in a great measure to the stability of the goods of these manufacturers that their yearly increase in production for the past seven years is attributable.

To all who are at all acquainted with the shrewdness and business tact of the men above named, the idea that *they* would put out goods enough in a single season to work their utter ruin if the seams failed, is extremely ludicrous, to say the least. Then there are a few firms whose goods for style and quality rival the best made in any part of the world, viz.: Bennett & Barnard, J. N. Smith, A. F. Smith, Wm. Silliman & Co., etc., and all seaming their shoes with cotton on Willcox & Gibbs' machine, for the single reason that they had learned that the goods of the first named stood better than their own seamed with E silk under thread, and D upper thread.

In this you have an additional reason for crediting my statement that "it was too late to talk of the unfitness of cotton for seaming shoes or anything else;" but this is not all, you must include nineteen-twentieths of all the shoe

manufacturers of Lynn, Haverhill, Salem, Beverly, Danvers, Marblehead, Stoneham, Newburyport, Portsmouth, N. H., Portland, Me., several in Boston, Brockton, New York City, Syracuse, Auburn, Rochester, Chicago, Newark, N. J., and Baltimore, Cincinnati and Louisville, besides many isolated factories scattered over the country generally.

There is not one manufacturer to be found anywhere who, having had one season's experience, has gone back to the old system of using silk and linen and the shuttle machine. Lastly, I will again refer to C. A. Wentworth, of Lynn, who does an extensive retail business, and makes his own goods of every kind. He has used cotton wholly for the past twenty months, seaming all his goods with it on a Willcox & Gibbs automatic tension machine, and he says that up to the present time he has not had a single shoe seam fail, while on the other hand while using his best efforts with shuttle machines and E silk under, and D upper threads, he was obliged to make good one pair per day on an average.

We venture the suggestion that if "F. S." was to join the semi-annual procession of disciples to this Mecca of their craft, he too might learn something to his advantage. He claims to have seen Lynn-made boots rip within two or three weeks. Well, if he had seen them rip in as many hours, or minutes even (as in pulling the boots on, for example), it would not necessarily be any argument against cotton or in favor of silk, as there are very many contingencies arising from malpractice in fitting uppers which would account for the failure, aside from the question of thread. The cupidity of a great many manufacturers leads them to use a *cheap needle*, that is certain to wear the thread out or nearly so, before the stitch is planted in the leather; the only thing they seem to care for being the lowest possible price and the most liberal discounts, while disregarding the probability of losing ten dollars on a case of boots to save one cent on a needle. Others again will attempt to close seams with cotton on a shuttle machine which involved a much larger needle to

carry the same size thread as silk, besides making a more rigid seam, owing to the non-elasticity of the stitch. The Willcox & Gibbs will carry the same thread with a needle less than half the size, and gives an elasticity of seam which precludes the possibility of the seam stretching far enough to break the thread.

"F. S." says, as a result of such ripping, many of the workmen have shoes made for their wives and daughters in establishments where there is nothing turned out but men's goods, and that he has fitted *seventy-five pairs in two years!!* used all silk, and they stood well. He might have added that ever since he was a child he has known people to have shoes made in custom shops where they did nothing but cobble and make to measure, but that does not prove that a cotton thread that would pull only one-third as much, would not have stood equally well. Had he made one of a pair with such cotton, and the other with silk to be worn by the same person, with the same pains taken with one as with the other, he might have learned something about the durability of cotton that he did not know before.

Again, "F. S." says: "I have sided up several pairs of men's boots with silk and they never gave out." Well, now, there is nothing wonderful about that, as he doubtless used an F or FF silk that would pull twenty-five pounds, and if he put only ten stitches to an inch, would give to a bootleg fifteen inches long no less than *seven thousand and five hundred pounds* holding strength to resist the strain in treeing the boot and hauling it on. Now we might deduct the seven thousand pounds, and trust the balance of five hundred to do all the holding necessary, as there is nothing to cramp or wear the thread in two in a *bootleg*, as there is in the wrinkles formed in the front and heel seams of a side-lace boot. Who ever heard of a man bursting the seams of his pantaloons below the knees? I could side up a pair of calf or cowhide bootlegs with No. 30 cotton and have them hold good until the bottoms were worn out, and then engraft the old legs on

to a new pair of vamps, and wear them out also. The only wonder about this matter is, that "F. S." should have mentioned the siding of boots as a proof of the superiority of silk over cotton, and yet with his apparently limited knowledge of cotton he expresses the opinion that "Mr. Lascell has evidently much yet to learn about it." Well, I accept that as being the most sensible remark he has made, for I realize that with all the attention I have given the subject I have yet more to learn than I thought I had when I began.

When a man gets to a point where he thinks he knows it all, it has then become necessary to hoist the *danger signal*. As between the views of the uninitiated superficial observer and myself, there is a wide divergency of opinion on this subject, and this divergence cannot be otherwise than the measure of value as between cotton and silk for durability in a shoe seam. In the former class will be found such as "F. S." who charged me with being "all carried away with the cotton idea."

Now the man is most effectually carried away who is first hoodwinked by prejudices, and then lugged off bodily in blank ignorance as to where he is going to fetch up; and as a man in that condition may chance to hear a remark from a bystander that will give him a clue to his whereabouts, so now I propose to give such, some facts that they may profit by. To this end I have instituted some simple and effective thread tests, which for fairness seems to me to be quite unobjectionable.

The fact is (as shown in previous chapters) that all other things being equal as to needle, tension, etc., the thread that will endure the most friction (as in the bending of the finished seam) is the most valuable. That there is a great diversity of opinion as to the relative value of silk, linen and cotton among manufacturers of shoes, gloves and clothing is evidenced by their choice, and the question is as to the *wisdom of their choice*. Three-fourths of all the shoe manufacturers, and nineteen-twentieths of the manufacturers of

gloves and clothing, would decide in favor of silk or linen as against cotton, but that does not alter the *fact* that cotton is superior to both, as the following will show.

I procured a spool of Leeson's No. 60 gray linen, Nonotuck D silk, and No. 24 four-cord gray cotton. There was lying on the bench a sewing machine attachment of plate-iron one-sixteenth inch thick, having a slot in one end as seen in Fig. 21. I rounded off the corners with a fine half-round file

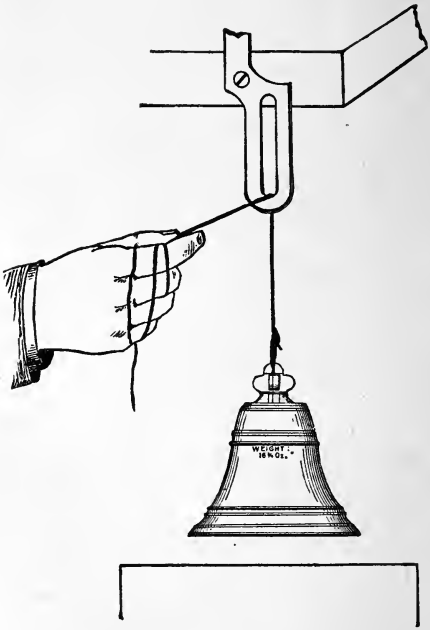


FIG. 21.

ILLUSTRATING THE DURABILITY OF COTTON.

and then polished the surface smooth with a strip of fine emery cloth, and for a final finish I drew back and forth over the edge, a strip of cotton cloth, which left a smooth polished surface as a friction surface across which to draw the thread.

After screwing this to the edge of the bench as shown in sketch, I took a paper-weight weighing sixteen and three-fourth ounces, and attaching the thread to be tested, passed it through the slot and with it raised the weight one inch so as to confine the wearing surface of the thread to as nearly one inch as possible. I placed a box under the weight so that the latter should rest within such distance from the wearing surface as to admit of only six to eight inches of thread between the latter and the weight. This precaution was deemed necessary in order that the stretch of the thread (if any), should not alter the position of the inch of thread being worn. I then raised and lowered the weight with each piece of thread tested until it parted, and with the following results:

	D Silk.	Linen.	Cotton.
First trial	194 times	218	1,643
Second trial	251	189	1,173
Third trial	163	214	1,396
Fourth trial	163	171	1,238
Fifth trial	163	138	1,593
Sixth trial	205	220	1,225
Total	1,139	1,150	8,268

Thus it will be seen that cotton averaged to be nearly eight times more durable than either silk or linen.

The silk pulled	$14\frac{1}{4}$ to $14\frac{1}{2}$ pounds
The linen pulled	$10\frac{1}{4}$ to $11\frac{1}{4}$ pounds
The cotton thread	$10\frac{1}{2}$ to $11\frac{1}{2}$ pounds

The above corroborates my former tests of various kinds as well as those of Mr. Charles Goodyear, Jr., the inventor of the justly celebrated Goodyear welt and turn machines. It also furnishes the key to the unparalleled success of some

three hundred manufacturers of ladies', misses' and children's shoes in Lynn and vicinity, who have used cotton and the Willcox & Gibbs automatic tension machine for seaming uppers. All these manufacturers formerly used silk and linen threads.

There are hundreds of shoe manufacturers whose prejudice in favor of silk and linen debars them from making any practical experiments in proof of the value of cotton, and, until they do, their opinion of it would be about as valuable as the opinion of a Hottentot regarding the customs and habits of modern civilization. They choose to remain in blissful ignorance of the saving to be effected as between the use of cotton and silk — the saving of one-third in the cost of seaming as between the speedy Willcox & Gibbs and the shuttle machines, as well as the enhanced value of their goods as compared with their present system, but as all such are reasonably certain to have part in the second resurrection, they can be excused from having part in the first.

"F. S." challenges me to make as good a seam with cotton on Willcox & Gibbs' machine as he can with silk on a shuttle machine. I intend to accept that challenge. If he will cut a pair of side-lace boots for some acquaintance of his, and send me one of them, I will close the seams inside of thirty seconds, and he may spend as many hours on his, and put on as many stays as he chooses, inside or outside, or both; and if my shoe seams, *without any staying*, rip before they are worn out, I will pay for the boots. However expensive his seams may be, they can serve no better purpose, and I will guarantee that the cost of the front and heel seams of my shoe shall not exceed one-sixth of one cent for both labor and thread, as done by the case, and I will not use cotton larger than No. 30.

Again, he says:

"One of the worst features of the Willcox & Gibbs machine is that if one stitch breaks, three or four and some-

times six or seven will pull out before it will fasten itself, while the stitching of two thread machines will only pull back two stitches at the most."

In that sentence Mr. "F. S." has displayed a vast amount of ignorance regarding *both machines*, for exactly the reverse of that statement would be the truth. In fact every shoe manufacturer and every shoe wearer in the country knows that when the shuttle stitch breaks there is no end of the ripping, and that a seam will rip from one-fourth to three-fourths of an inch per day where there is but one line of stitching, while with the Willcox & Gibbs' twisted loop stitch, a seam without staying will wear for months with the thread worn off or broken without ripping a single stitch.

In corroboration of the above statement we refer to a pair of shoes which were made November 17, 1881, seamed and vamped on Willcox & Gibbs' automatic machine, with No. 36 Coates' cotton. This is a pair made in proof of the fact that ladies' boots seamed with a single line of stitches, and with *no stays* inside or outside to support the seam, would prove to be more durable than seams made in the usual manner with D and E silk and well stayed. These boots were shown to a score or more manufacturers of first-class goods in Lynn and in Cincinnati, O. They were put to service on December 4 and worn constantly until August 1, 1882. The bottoms wore through nearly to the foot. There is a hole as large as a five-cent nickel worn directly across the heel seam above the stiffening, and in the bend of the seam in front three wrinkles formed, the summit of each being worn off, and the thread parted. Now, the thread was worn off (especially in the heel seam) three months before the shoes were laid aside, and to-day the seams show that not a single stitch has started from either of the four holes or places where the stitch was worn in two, and the hole in the heel-seam enlarged no faster *at the seam* than the leather wore on either side of it, *the stitches being solid to the very edge of the holes.*

There is probably not a single shoe manufacturer in the land who would not as soon expect to see a man raise himself from the ground by tugging at his boot-straps as to see a single line of seaming stand like this that had been done with any kind of thread on a "two-thread machine."

In a subsequent issue of the "*Shoe and Leather Manufacturer*," Mr. "F. S." reiterated his former statements but took no notice of my acceptance of his challenge to make as good a seam with cotton on a Willcox & Gibbs machine as he could do with silk on a shuttle machine, whereupon I challenged him as follows:

He may cut a pair of side-lace or gent's congress boots, and close one of them on a Wheeler & Wilson No. 6 machine, and may use E silk for under thread and D upper, and stay the seam if he chooses outside or inside, having but one line of seaming stitches.

I will close the other boot with a single line of seaming stitches on a Willcox & Gibbs machine, with cotton no larger than No. 36, and with no staying of either the leather or linings, and he may stay his linings if he chooses. After the shoes are finished, ready to wear, I will allow the front seam of my shoe to be chopped in two twice on each seam, and his shall be chopped in two once on each of the front and heel seams, and the two cuts on his seams shall be located the same as two of mine, and I will stake $100 that my shoe will rip less stitches in a given time from four cuts, than his will from two. This is putting the odds two to one in his favor.

A fair and impartial test of this kind ought to settle this question of ripping by the breaking of a stitch in a finished seam, and if "F. S.'s" statements are correct, with the odds I have offered of two to one in his favor, he certainly has a sure thing of winning *a cool hundred dollars*, and I trust he will lose no time in securing the stake. He has still greater assurance of winning from his discoveries of shoes ripping

that he says "were closed with cotton on a Willcox & Gibbs machine," *i.e.* he credits his own statements in that regard.

* * * * *

As to siding a pair of cowhide boots with No. 30 cotton on Willcox & Gibbs' machine, "F. S." says he thinks I "can't be speaking seriously." I would say in reply that I am not given to making statements that are not worthy of consideration, regarding this subject at least, and I will stake another $100 on my ability to side up a pair of boots (that are not too heavy to be sewed with the Willcox & Gibbs machine) with No. 30 cotton that shall last until the boots are worn out, and that, moreover, these boots can eventually have new vamps put on in the usual way. These may be worn out also, and then all that is left of the original sewing will remain whole.

Regarding these tests, I would suggest that a committee consisting of three prominent shoe manufacturers be chosen to superintend them, and decide upon the results. "F. S." may name one, I will name one, and the two thus chosen to agree upon the third. I will not object on my part, to having every one of the committee chosen from men who are prejudiced against both the machine and cotton, nor will I object to their being men that I never saw. All I ask is that at least two of them shall be fair-minded men. I would be pleased to have two of the committee chosen from some of the most prominent shoe manufacturers of New York City or State, who neither use cotton nor the Willcox & Gibbs machine, nor believe in them.

I am also willing that the threads to be used shall be such as are employed by shoe manufacturers, and found on sale and made prior to this date, and that they be used in the ordinary way as found, without any special preparation for this occasion.

The result of these experiments and deliberations to be published in full in the *Shoe and Leather Manufacturer.*

Now if "F. S." will proceed to the tests with the view to arriving at the facts, and also to scoop in *two hundred dollars* (which, according to his statements, he would be morally certain to do), he will greatly oblige

G. W. LASCELL.

Mr. "F. S." replied to the above as follows:

"As to his challenge in regard to ripping of seams, he states that his shoes shall be cut twice in each seam, while mine shall be cut once in each seam; this, he says, is putting the odds two to one in my favor. Perhaps it is, but I would remind him that by cutting his seams in two places they are less liable to rip than if cut in one, as any one will see if he will reflect a moment, and, as I said before, the test on one pair of shoes proves nothing. Then, again, a seam being cut in two places, allows it to work loosely in the cuts without straining the thread much, and then again I would say that I am not a sporting man, and am not in the habit of staking money on anything whatever."

Comments on *such* a reply to my challenge would be superfluous, and the reader can place just such value upon his previous statements as this reply would naturally warrant.

CHAPTER XIII.

STAYING SEAMS.

Apropos of the thread discussion there comes the matter of staying seams.

If the question is asked, "Why do you stay your seams?" the answer will be, "To support and strengthen them of course."

Few if any would claim that an outside leather stay adds that beauty to the shoe that the strap stitched over the breech piece or breast collar adds to a harness, to say nothing of the incongruity of transferring to the shoe of a lady the part of a horse gear that ornaments its breeching. Then, applying this ornament adds much to the expense of a shoe. Aside from the cost of the stay, it takes three times as much labor and thrice the quantity of thread and needles and wear and tear of the machines, and the question is as to the compensating feature of the matter.

Does the stay support and strengthen the seam and render the shoe more durable, and if so, how, and to what extent? I claim that it is entirely useless, and as an ornament on a par with a wart.

The superficial observer would deem it absurd to suppose that a strap of leather stitched over a seam did not add all of its strength to it. I admit all that the objector may claim for the *leather*, but that is of no consequence, since its stability depends wholly on the stitches that hold it, and as the action upon the thread in the stay begins simultaneously with that in the seam, it follows that when the seam needs holding the staying qualities are absent. This is, first, because the direction of the stitch in the stay causes more friction on

the thread than that in the seam is subjected to, the difference being the same as that between the stitches in the inseam of a shoe bottom and those in the welt, or as between the seam of a turn shoe and the through and through sewing of a McKay machine. Thus it will be seen that the stitches in the stay are subjected to greater strain and friction where the seam bends forward and back than in the seam where the stitches are bent by the same motion sideways or at right angles with those in the stay. Thence it is, that the stay stitches always fail first, except in cases where the seaming stitches have been severed by the needle in running the stay stitching too close to the seam.

Now, this difference is greater or less in proportion as the two threads of a shuttle machine are equalized as to length. There is not one seam in a million where the under thread is of the same length as the upper or needle thread, and the greater this disparity in length of the two, the greater the strain and consequent friction on the thread. I think it will not be disputed that as a rule the amount of thread used from the shuttle is not over one-fourth, or at most one-third, of that used from the spool, so, however desirable it may be to have the upper and under threads of equal length, it is practically impossible to maintain such a sufficient uniformity of tension on the two-thread stitching machines ordinarily used to insure such a result. This is one of the reasons why the seaming performed by the Willcox & Gibbs automatic machine is so much superior to that done by any other. A second reason is that twice the bulk of thread can be drawn into a given sized hole. A third reason is that the stitch is so much more elastic, and a fourth reason is that the thread invariably used on that machine is *cotton*, which will endure from six to eight times more friction than either silk or linen, as I have shown in the preceding chapter. A fifth reason is that the automatic tension feature of that machine insures perfect uniformity of stitching not only throughout the shoe, but also throughout any number of

cases of shoes. But returning to the stay, we find that the stitching is invariably done on a shuttle machine, and, as I have shown, the life of the stay stitching is necessarily shorter than that of the seam, whether the latter be done with one machine or another; hence it follows that whatever the strength of the stay itself may be, it can serve no useful purpose in preventing the seam from ripping, as one or the other or both lines of stitching in the stay will give out first. You might as well anticipate the cracking of the vamp by stitching on a patch before the upper is lasted.

The idea of a stay seems to be to enable the seam to withstand a greater strain than it could otherwise bear, while the fact is, there is ten times as much holding strength in the unstayed seam as there is any need of.

It will be claimed by some that an outside stay prevents the outside wearing on the seam. Well, so would the patch prevent the wearing of the vamp until it got loose; and then the shoe has come to repairing, and so it has when the stays rip. That the protection the outside stay affords is of little consequence, is proved by the fact that a majority of shoes have the stays on the inside. I am ready to concede that a *heel-seam* stay averaging an inch or more in width, that would reach around on the side of the boot and with two or three rows of stitching, might remain whole long enough to serve as a cover to a ripped seam beneath, especially where the closing had been done with either *linen or silk thread on a shuttle machine.* Neither the heel nor front seams give out by reason of any lateral strain exerted in pulling the closed pieces asunder, on the contrary, the ripping is caused by *the friction on the thread,* caused by the bending of the seam forward and back at each step of the wearer, and hence it is that the seams give out first in the wrinkles formed just above the stiffening on the heel seam, in the curve in front and at the wrinkle or joint formed at the ball of the foot. In the latter the leather itself cracks or wears in two from

the same cause, and to stay the new vamp with a patch stay would no more prevent the vamp from cracking than the stay patches over the seams would prevent the thread from wearing in two at those points of greatest friction. It must be patent to every one that the lateral strain is as great across the instep as anywhere, and also that the seam is very rarely seen to give out there. The reason is that at that point the seam is not bent like a door hinge at every step, and consequently the friction on the thread at that point is comparatively slight. If a seam is closed with a thread that will pull ten pounds, and you put in eighteen stitches to the inch and the seam is ten inches long, you have a seam that will withstand a lateral strain of 1,800 pounds. Now, a foot must be squeezed very hard to produce a strain of twenty-five pounds on the upper, and then you would have a *surplus* of 1,775 pounds of *unappropriated* holding strength. You have trebled the cost of the seam by adding a stay that gives a ton or two more of superfluous strength to help a seam to withstand a lateral strain of *only twenty-five pounds* at most. With all this trouble and expense, the stayed seams fail, and many manufacturers of first-class goods have resorted to double inside stays, which involved two rows of stitches on each side of the seam. But the seams failed even then, because multiplying stays and rows of stay stitching does not prevent the seam from bending and wearing off the thread.

Now, if there is any way of seaming uppers so as to have them hold solid *until the leather is worn through*, it is certainly of much importance to know it, and especially if they can be done at one-fourth the cost of the usual method. I have worn test boots for the past six years, for the purpose of testing the durability of cotton. My boots were cut congress and never stayed, for the reason that I did not want to help the cotton in the slightest degree, and the cotton used was never finer than No. 36 or coarser than No. 30. I have put eighteen to twenty stitches to the inch with a No. 1 Willcox & Gibbs needle, the seams have been all closed with

the Willcox & Gibbs automatic tension machines, and I have yet to note the failure of a seam thus sewed. I now have on a pair of goat congress which were made last May. I wore them until December, and have had them on about two weeks this spring. They have worn nearly to tapping; the seams to all appearance are as sound as ever and I fail to see how any amount of staying could have been of any service, for the seams can be trusted to remain whole as long as the leather will last. The bottoms are single soled and stitched on McKay machine with No. 20 sixteen cord cotton coated with paraffine, and although the loops have long since been worn off, and four inches of seams on each shoe have been worn down below the bottom of the channel, yet the threads stand like pegs, even with the surface of the soles. In Chapter XII, page 113, I mentioned a pair of ladies' kid button boots closed in the same manner, with No. 36 cotton and no staying, which were worn eight months, and not a stitch gave out except in places where holes were worn through the leather directly across the seams; but at these places the stitches held solid to the very edges of the holes. These shoes were laid aside last August, being entirely worn out, and another pair substituted, which were seamed in like manner with No. 36 cotton on Willcox & Gibbs' machine with no stays. These were worn until the first of April, and proved equally durable in every respect. The bottoms of this pair were sewed on the McKay machine with cotton and paraffine wax, and they have worn entirely out without ripping. I have recently substituted another pair of these, to continue the tests.

Now, if it is possible to seam three pairs in such a manner as to have the leather wear out before the seams fail (the leather being of quality to insure eight months' steady wear), then it is possible that millions may be done in like manner without incurring the slightest risk of failure, and as seams thus made do n't exceed one-fourth the cost of those made in the usual way, besides being very much neater than stayed

seams, this matter becomes of vast importance to both the shoe manufacturer and consumer. It would indeed seem that all retailers, as well as manufacturers and consumers possessing good sense and taste, would hail the day when it would be considered an outrage to cover a new and otherwise neat boot with *patches*.

CHAPTER XIV.

STAYING SEAMS.

A REPLY TO MR. LASCELL.

"In Mr. Lascell's argument he makes a comparison of the seam stay to a 'strap' applied to a harness, and says: 'There is an incongruity in transferring to the shoe of a lady the part of a horse gear that ornaments its breeching.' Now this suggestion may be amusing, but as an analogy it is exceedingly far-fetched and barren of point. If we were to admit its application, we would be obliged to abandon all uses of leather for foot-wear, and all kinds of thread that go into the manufacture of boots—in fact, ladies would have to go barefoot because horses wear shoes.

"On this charge that the stay adds much to the cost of the shoe, I am willing to admit; but I claim that the extra cost is more than compensated for in the extra wear that the shoe returns. There is no 'question' in this matter; tangible proof is at hand to substantiate my claim. So far as it may or may not be ornamental, is a matter of taste. But if it is as useless as a protector of that part of the boot to which it is applied, as Mr. Lascell would have your readers believe, he must admit that this spending of more than half a million annually for outside staying must be largely accounted for by its capacity to adorn. A majority of people patronize an article for a purpose, and if they are disappointed in that purpose, they cease to use the article. If the seam stay has no practical benefits as a protector, of course it is sought as an ornamentation, and to apply the terms 'warts' and 'patches' as synonymous to delicately molded seam stays is merely an indication that Mr. Lascell's idea of beauty differs from that of most people.

"In considering his argument from the mechanical point of view, I am hardly able to comprehend whether he makes his estimates with an eye to disparage the claims of the seam stay, or to enhance other interests to which the stay may suggest some obstruction.

"His estimates in regard to the mechanical strength of the

seam—so far as they may apply to stay—are evidently incidental and immature. The fact that the stay stitches 'fail first' may be traced to other causes than he mentions, and if he wishes it to be understood that the stitching of the stay gives out sooner than any other part of the stay, I take leave to differ very emphatically. In any discussion of the durability of the seam, stayed or unstayed, I base my claims on the familiar adage 'union is strength;' that a bundle of sticks is stronger than a single piece of equal dimensions, and that the portion of the boot about the heel seam and above the stiffening would wear longer in a combination of thicknesses of an appropriate aggregate, than in a single thickness of equal aggregate, other things being equal. Here is where the stay begins its career and makes its first claim to usefulness. All breakages in this locality first appear upon the outer surface of the boot, and usually from causes that Mr. Lascell has failed to mention, viz.: friction with external objects; and the fact that this breakage may first appear in the stay demonstrates a prominent feature of the legitimate purpose of the stay. Under this breakage you invariably find whole stock, and the boot is prepared to continue its service in a uniformity of wear. The heel seam having obtained this lease of existence—made possible by the stay—is now able to hold out until breakages at other points render the boot unavailable, while, had it not been for the stay, it would long ago have become unsightly and been discarded.

"Mr. Lascell's elaborate array of figures, showing the accumulated strength of a given number of stitches, is a sterile beat at the bush for an argument where no argument exists, so far as the seam stay is concerned, when considered in connection with a subsequent statement; for he says:—'I have worn test boots for the past six years, for the purpose of testing the durability of cotton. My boots are cut congress and never stayed, for the reason that I did not want to help the cotton in the slightest degree, an admission that I take leave to appropriate as a testimonial for the seam stay, as a resistance in some slight degree to the 'friction' suggested in another portion of his letter.

"In conclusion, I wish to say that the application of the stay as a protector of the seam which it covers is no novelty in the theory of mechanics. It is a fundamental principle that finds expression in almost every branch of mechanical construction, and its utility cannot be thwarted by merely speculative conjurings.

"Its application to the manufacture of boots and shoes entitles it to just as much consideration as when applied to harness, clothes, or even to methods in architecture. In the latter, it protects the joints; in the harness it protects, strengthens and adorns the adjoining members; in boots and shoes it protects, strengthens and adorns the seams.

"STAYER."

CHAPTER XV.

STAYING SEAMS.

REPLYING TO "STAYER."

I WILL say that I made no allusion whatever to the difference between the wearing qualities of the *stay stitching* and the *stay*, and I am willing to concede that there may be a wide margin of difference between the two, which may go to the credit of either alternately, according to the quality of the stay or the stitching.

I based my argument on the incontrovertible ground that the seam stitching is not susceptible of being injured in any degree as compared with through and through stitching on the stay, because the former bends *sideways*, like the seam in a turned shoe bottom, while the latter bends forward and back at right angles with the stay, like through and through stitching of a McKay machine.

Now, the stay stitching is subjected to much the hardest strain, for two reasons: First, from the great inequality in the length of the upper and under threads, the point at which the two threads cross each other being to one side of the centre, thus causing still greater strain than if the upper and under threads were of equal length and the threads crossed each other in the *centre* of the material. Second, because when a strap is stitched on the surface of the leather, and both are bent forward and back at every step in the direction that the stitches go, there is a strain on the stitches in proportion to the thickness or flexibility of the upper leather and the stay. In the bending of two pieces of leather thus united, the tendency is for one piece to move upon the other;

one must contract, while the other expands, and *vice versa*. This is the trouble with the bottom sewing of the McKay machine. The constant working of the outsole upon the inner sole is what strains and cuts off the stitches, whereas the seam in the bottom of a turned shoe bends sideways precisely like the seams in a shoe upper. The durability of a turned sole shoe seam is proverbial, and the lack of durability in the through and through stitch of the McKay machine is quite as well known.

"Stayer" argues that union is strength, and that "a bundle of sticks is stronger than a single piece of equal dimensions."

As to the *sticks*, I should say that if they were perfectly jointed and fitted, their strength would depend on the quality of the *glue* with which they were united, while without such perfect union I should prefer a single piece of equal size, but to argue from such premises that the portion of the boot about the heel seam and above the stiffening would wear longer than a single thickness of "equal aggregate" is extremely fallacious.

Yet my opponent says: "Here is where the stay begins its career and makes its first claim of usefulness." Further on he says: "Mr. Lascell's elaborate array of figures, showing the accumulated strength of a given number of stitches, is a sterile beat at the bush for an argument where no argument exists," etc.

Now the idea of staying a seam implies holding and strengthening it, and the question is as to the need of any auxiliary help to hold the seam from ripping. If the holding strength of the thread in the closed seam is a hundred times more than any strain the seam can be subjected to, then it follows that any additional help is not only superfluous, but a waste of labor, stays, silk, etc.

That the holding strength of the thread in the seam equals the number of pounds a thread will pull multiplied by the number of stitches in the seam is clear enough.

In a seven-inch heel seam closed with a thread that will pull ten pounds on the spool, and damaged only to the extent of three pounds by its passage through the needle, you would then have seven hundred and eighty-four pounds of holding strength. As the seam could not be strained in wearing to the extent of ten pounds, there would then be a surplus of seven hundred and seventy-four pounds.

It only needs this illustration to show the extreme folly and wastefulness of stitching a strap over a seam that has such a surplus of holding strength before the stay is applied. At this point I will describe an experiment I made to test the truth of my statement.

I seamed two pieces of heavy leather, which taken together measured three-sixteenths of an inch in thickness. I made the seam two inches long with the Willcox & Gibbs machine, and put fourteen stitches to the inch, with a cotton thread six-cord No. 24. I attached a vise to one side of the seam a half inch from and parallel with it. I then laid two strips of board side by side, leaving a quarter inch space between them, through which I passed the leather, until the vise rested on the boards. I then attached a two-inch jawed vise a half-inch from the seam, and parallel with it beneath the boards. I then attached a box to this vise, and loaded it with iron until the seam broke. The box and its contents, including the under vise, weighed two hundred and fourteen pounds. The average of four trials of the thread gave eight and one-half pounds, or two hundred and thirty-eight pounds strength to twenty-eight stitches, which parted at a strain of two hundred and fourteen pounds, being only twenty-four pounds less than my theory calls for, viz.: that the strength of a seam is the strength of the thread multiplied by the number of stitches.

The leather used was from a very thick neck piece of old-fashioned boarded brush goat. One end of the seam was found to have been stretched out of a line fully three-eighths of an inch, which would account (in part at least) for the

difference of twenty-four pounds between the strength of seam and the aggregate pulling strength of twenty-eight stitches at eight and one-half pounds each, to say nothing of the depreciation of the thread by the using. Now, then, according to this test, a seam eight inches long would have an aggregate holding strength of eight hundred and fifty-six pounds, and as the seam could not be subjected to ten pounds strain in wearing, you then have in the heel seam alone eight hundred and forty-six pounds of holding strength *unappropriated.* Yet "Stayer" says, that "Mr. Lascell's elaborate array of figures, showing the accumulated strength of a given number of stitches, is a sterile beat at the bush where no argument exists." Surely if no argument exists in this case, it is because a self-evident fact will admit of none.

Again, "Stayer" says: "The charge that the stay adds much to the cost of the shoe I am willing to admit, but I claim that the extra cost is more than compensated for in the extra wear that the shoe returns."

FIG. 23.

STAYING SEAMS.—THE "SADDLE" SEAM.

Let us see. In Fig. 23 of the accompanying engravings, we give a sectional end view of what is termed the "*saddle* seam," it being closed right side out to better adapt it to receive the Sutherland patent molded stay. Now, if the seam was strained to any appreciable extent, the semi-circular stay would straighten out and thus serve no useful purpose in helping the seam. In the second place, the stay is exceed-

ingly thin, so much so as to allow of its being folded or doubled so as to present a smooth and finished edge and not appear too clumsy. The top of the stay acting as a fender to "external objects," necessarily wears out very soon, leaving an ugly-looking seam, which must receive another cover, although the bare seam would wear three times as long as the stay, and serve the same purpose as a fender.

I do not differ with "Stayer" in his opinion that this stay wears out sooner than the stitches that hold it, as it will be seen that the summit of the stay rises so far above as to protect them from external friction. There is also a substantial reason for closing seams in this way, and that is that it leaves the inside of the boot free from any ridge to hurt the foot. Such a ridge upon the *outside* could not be tolerated by the wearer, so it furnishes an excellent excuse for the very neat and delicately molded Sutherland stay to cover it, and as a *cover* it is not only indispensable, but decidedly neat.

FIG. 24.

SECTIONAL END VIEW OF A CLOSED SEAM WITH A FLAT STAY OUTSIDE.

Fig. 24 represents a sectional end view of a seam closed in the regular way with the seam inside and a flat stay outside. Now, this is the only form of staying that can by any possibility help to hold the seam, if its help were needed. With the eight hundred and forty-six pounds of unappropriated holding strength of seam stitches, its life is far too short to be of any use, as the exposed stitches are soon worn off and the stay let loose. But some contend that when that occurs

the stay may be ripped off, and then have a good seam left to wear out the shoe. That would be just as true when the stay is omitted, for even then the seam thread is thoroughly protected from contact with "external objects," it being *under* the leather, which must be worn entirely through before any wear can come upon it other than that caused by bending the seam forward and back in walking.

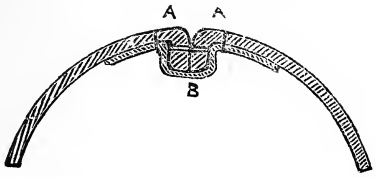


FIG. 25.

A SEAM WITH INSIDE STAY.

Fig. 25 represents a seam with an inside stay, usually of cloth or web, and as fully three-fourths of all shoe seams are stayed in this manner, it deserves more than a passing notice. It will be seen that the stiching draws this stay tightly over the seam, forming a ∪ shaped *outward* curve. Now, this, like all other staying, is supposed to aid materially in supporting the seam. Now, the top of the seam at *B* is the fulcrum over which the stitching at *AA* is drawing, and the tighter this stay is stitched on, the greater the tendency *to pull the seam open*, and when from any cause the seam rips, the stay necessarily curves in the opposite direction, as seen in Fig. 26. Not until then can it possibly do any staying whatever, and then only in the manner here illustrated. It passes all comprehension that men of good sense in business matters generally, as shoe manufacturers are, could perpetrate and perpetuate such a clumsy device. Yet I have known manufacturers of first-class goods to resort to *kid* stays put on in this manner, and

some have put on *two*, because they found that one stay of either cloth or kid failed. Evidently the fool killer has overlooked an important field of operations.

FIG. 26.

SHOWING THE CURVING OF A STAY AFTER THE SEAM HAS BEEN RIPPED.

"Stayer" takes umbrage because I compared the outside leather stay to the raised strap applied to the breeching of a harness, and spoke of the incongruity of transferring to the shoe of a lady the part of a horse gear that ornaments its breeching. He says on this point: "Now, this suggestion may be amusing, but as an analogy it is exceedingly far-fetched and barren of point," etc. Now, if anything was needed to make the analogy more complete I need only to mention the fact that the molded stay patent was set aside by the courts as void on the ground that the same had been previously used on harness. The raising and creasing machines for molding harness straps that have been in use for the past twenty-five years, are identical with those used in molding and creasing the edges of the stay.

"Stayer" further remarks, that "If the stay is as useless as Mr. Lascell would have your readers believe, he must admit that this spending of more than half a million annually for outside staying must be largely accounted for by its capacity to adorn."

Well, a patch adorns a pimple or a hole in a shoe, but when you close the shoe seams right side out, you raise an unsightly ridge that needs adornment more than either, and, so far as that form of seam is concerned, there is no question of the capacity of the molded stay to adorn it; but when you close a seam in the usual way, with cotton on the automatic Willcox & Gibbs machine, you have a seam that no kind of adornment can improve, and which needs no auxiliary aid to strengthen.

In 1875 I commenced to demonstrate the superior wearing qualities of the cotton over the silk fibre for shoe seams, as well as the merits of the Willcox & Gibbs machine over shuttle machine stitches for producing strong and elastic seams. The result has been the saving of millions to shoe manufacturers, and, as it is possible to save as much more by the abandonment of the more than useless stay, may it not be just possible to find in this a proper incentive for pointing out the way.

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"Willimantic" threads are same price for all numbers and colors, and same length on each spool.

Threads sold by weight are different price for each number. If you pay the pound price for No. 40—and the actual size of what you get is No. 30,—you lose the difference in length.

All the Threads manufactured by this Company can be procured on large spools to be used in connection with the new device for unwinding, cut of which is shown on the opposite page.

The Three-Cord Soft and Silk Finish is made of same stock as the Six-Cord, viz., Combed Sea Island Cotton.

The Intrinsic Shoe Thread is made of Combed Sea Island Cotton, Soft and Glace finish; wound on 600 yard spools.

The Threads put up by this Company are Warranted Standard Size, Full Length, free from all Imperfections.

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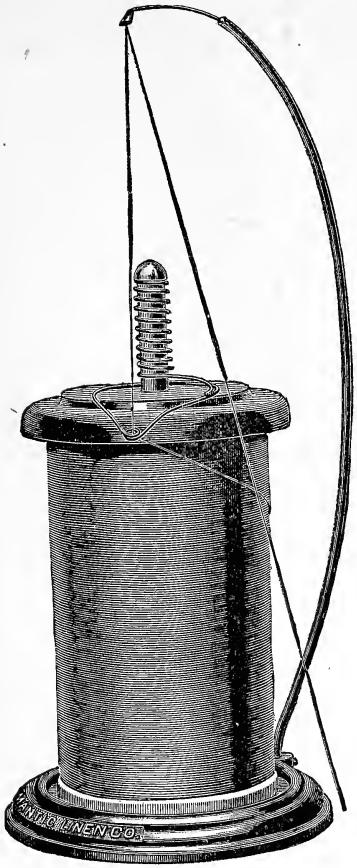

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As the Needle does all the sewing, it is important that it be a good one, to avoid skipping stitches or wearing the thread out before it is landed in the goods, and also to avoid waste of needles, time and material, as well as to make handsome and durable seams.

Our long experience in making Special Needles for fine shoe work, warrants us in saying that we can fully meet every requirement, and we would respectfully solicit a trial of them, as well as of our Patent Wax Thread and McKay Needles, which are a decided improvement over the old style round blades, both of which we make and sell at same price.

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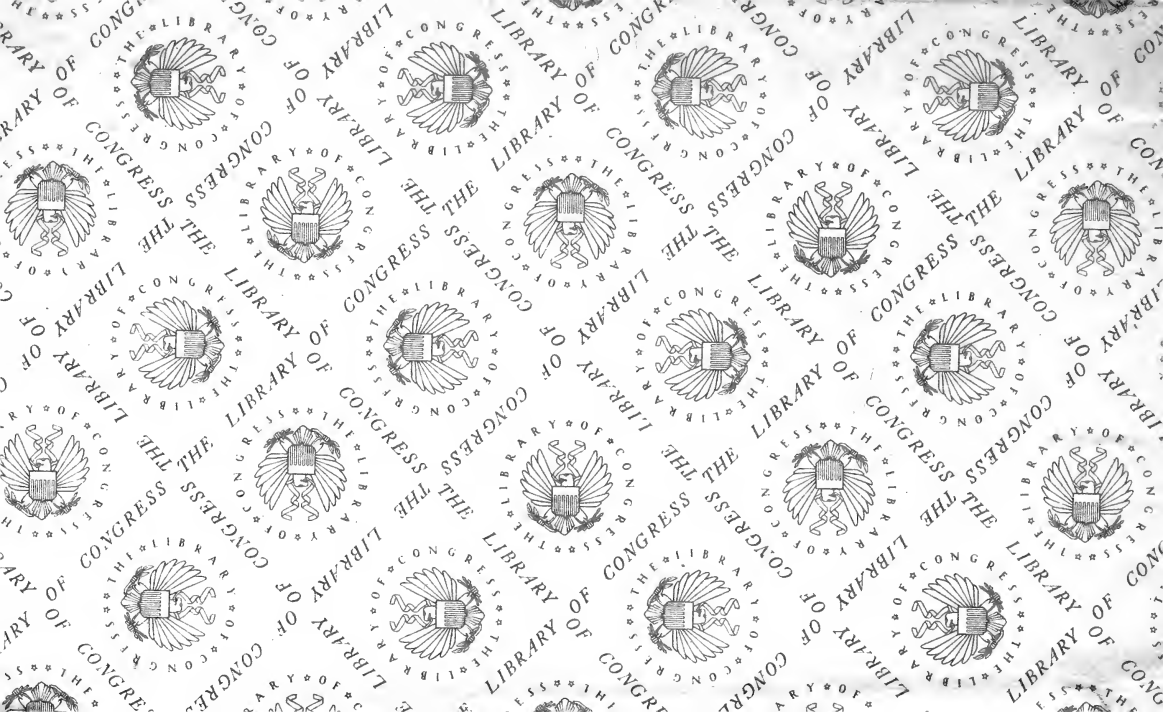
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